

**DOBO HALL RENOVATION
PACKAGE A**

**THE UNIVERSITY OF NORTH CAROLINA WILMINGTON
WILMINGTON, NORTH CAROLINA
SCO ID: 18-19798-01A**

EMERGENCY DECLARATION STATUS



**PROJECT MANUAL
BID DOCUMENTS**

Volume 1

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MOSELEYARCHITECTS

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

TABLE OF CONTENTS

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

SEALS PAGE

ADVERTISEMENT	REFER TO CMR's MANUAL
NOTICE TO BIDDERS	REFER TO CMR's MANUAL

000101	GENERAL CONDITIONS OF THE CONTRACT (0C-15CM)
000102	SUPPLEMENTAL GENERAL CONDITIONS
000103	GUIDELINES FOR SELECTION OF MINORITY BUSINESS PARTICIPATION IN STATE CONSTRUCTION CONTRACTS

BID FORMS	REFER TO CMR's MANUAL
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DIVISION 01 – GENERAL REQUIREMENTS

011000	Summary
012500	Substitution Procedures
013100	Project Management and Coordination
013200	Construction Progress Documentation
013300	Submittal Procedures
014000	Quality Requirements
014200	References
014520	Testing, Adjusting and Balancing (TAB)
015000	Temporary Facilities and Controls
016000	Product Requirements
017300	Execution
017419	Construction Waste Management and Disposal
017700	Closeout Procedures
017839	Project Record Documents

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

DIVISION 2 - EXISTING CONDITIONS

None

DIVISION 3 - CONCRETE

033000	Cast-In-Place Concrete
034900	Glass-Fiber Reinforced Concrete (GFRC)

DIVISION 4 - MASONRY

042000	Unit Masonry
047200	Cast Stone Masonry

DIVISION 5 - METALS

054000	Cold Formed Steel Framing - Structural (CFSF-S)
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DIVISION 6 - WOOD, PLASTICS, AND COMPOSITES

061000	Rough Carpentry
061600	Sheathing
064023	Interior Architectural Woodwork

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

072726	Fluid-Applied Vapor-Retarding Membrane Air Barriers
073113	Asphalt Shingles
074213	Metal Wall Panels
074646	Fiber Cement Panels
077200	Roof Accessories
078100	Applied Fireproofing
078413	Penetration Firestopping
078426	Thermal Barriers for Plastic
078446	Fire-Resistive Joint Systems
079200	Joint Sealants

DIVISION 8 - OPENINGS

081113	Steel Door Frames
081416	Flush Wood Doors
081613	Fiberglass Reinforced Polyester (FRP) Flush Doors
084000	Aluminum Storefronts

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

087100	Door Hardware
088000	Glazing
089000	Louvers and Vents

DIVISION 9 - FINISHES

092216	Cold Formed Steel Framing - Non-Structural
092900	Gypsum Board
095113	Acoustical Panel Ceilings
096513	Resilient Base and Accessories
096519	Resilient Floor Tile
096813	Tile Carpeting
098433	Sound Absorbing Wall Units
099100	Painting

DIVISION 10 - SPECIALTIES

101400	Signage
102600	Wall Protection
104313	Defibrillators and Cabinets
104400	Fire-Protection Specialties

DIVISION 11 - EQUIPMENT

Not Used

DIVISION 12 - FURNISHINGS

122113	Horizontal Louver Blinds
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DIVISION 13 - SPECIAL CONSTRUCTION

Not Used

DIVISION 14 - CONVEYING EQUIPMENT

140120	Traction Elevator
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DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SPECIFICATIONS – VOLUME 2

DIVISION 21 - FIRE SUPPRESSION

210500	Common Work Results for Fire-Suppression
211000	Water-Based Fire-Suppression Systems
213113	Electric-Drive, Horizontal Split Case Fire Pumps

DIVISION 22 - PLUMBING

220500	Common Work Results for Plumbing
220513	Motor for Plumbing Equipment
220516	Expansion Fitting and Loops for Plumbing Piping
220517	Sleeves and Sleeve Seals for Plumbing Piping
220519	Meters and Gages for Plumbing Piping
220523	General-Duty Valves for Plumbing Piping
220529	Hangers and Supports for Plumbing Piping and Equipment
220553	Identification for Plumbing Piping and Equipment
220700	Plumbing Insulation
221113	Facility Natural Gas
221116	Domestic Water Piping
221119	Domestic Water Piping Specialties
221125	Circulating Pumps
221316	Sanitary Waste and Vent Piping
221319	Sanitary Waste Piping Specialties
221413	Facility Storm Drainage Piping
221423	Storm Drainage Piping Specialties
223400	Fuel Fired, Domestic-Water Heaters
224000	Plumbing Fixtures
226113	Compressed Air Piping for Laboratory and Healthcare Facilities
226119	Compressed Air Equipment for Laboratory and Healthcare Facilities
226113	Vacuum Piping for Laboratory and Healthcare Facilities
226119	Vacuum Equipment for Laboratory and Healthcare Facilities
226700	Processed Water System for Laboratory and Healthcare Facilities

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

226719 Processed Water Equipment for Laboratory and Healthcare Facilities

DIVISION 23 - MECHANICAL

230130 Existing HVAC Air Distribution Cleaning
230500 Common Work Results for HVAC
230513 Motors for HVAC Equipment
230514 Variable Speed Drives
230516 Expansion Fittings and Loops for HVAC Piping
230517 Sleeves and Sleeve Seals for HVAC Piping
230519 Meters and Gages for HVAC Piping
230523 General-Duty Valves for HVAC Piping
230529 Hangers and Supports for HVAC Piping and Equipment
230548 Vibration Control for HVAC
230553 Identification for HVAC Piping and Equipment
230700 HVAC Insulation
230713 Fire Rated Insulation
230800 HVAC / Plumbing Commissioning Requirements
230900 Building Management System
230993 Sequences of Control
232113 Hydronic Piping
232123 Hydronic Pumps
232350 Refrigerant Detection and Alarm
232500 HVAC Water Treatment
233113 Metal Ducts
233300 Air Duct Accessories
233423 HVAC Power Ventilators
233600 Air Terminal Units
233614 Laboratory Temperature and Airflow Control System
233713 Diffusers, Registers, and Grilles
233723 HVAC Gravity Ventilators
234100 Particulate Air Filtration
235100 Breechings, Chimneys, and Stacks
235113 Draft Control System

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

235216	Condensing Boilers
236416	Centrifugal Water Chillers
237200	High Efficiency Energy Recovery System
237323	Custom Air Handling Units
237513	Custom Energy Recovery Units
238126	Ductless Min-Split Air Conditioning Units
238219	Fan Coil Units
238239	Unit Heaters

DIVISION 26 - ELECTRICAL

260519	Low-Voltage Electrical Power Conductors
260526	Grounding and Bonding for Electrical Systems
260529	Hangers and Supports for Electrical Systems
260533	Raceway and Boxes for Electrical Systems
260544	Sleeves and Sleeve Seals for Electrical Raceways and Cabling
260553	Identification for Electrical Systems
260923	Lighting Control Devices
262200	Low Voltage Transformers
262416	Panelboards
262713	Electricity Metering
262726	Wiring Devices
262816	Enclosed Switches and Circuit Breakers
262913	Enclosed Controllers
263213	Engine Generators
263600	Transfer Switches
264113	Lightning Protection for Structures
264313	Surge Protection for Low-Voltage Electrical Power Circuits
265119	LED Interior Lighting

DIVISION 27 – COMMUNICATIONS

270500	Common Work Results for Communications
271500	Communications Cabling

DIVISIONS 28 - ELECTRONIC SAFETY AND SECURITY

283111 Digital, Addressable Fire-Alarm System

DIVISION 31 - EARTHWORK

None

DIVISION 32 - EXTERIOR IMPROVEMENTS

None

DIVISION 33 - UTILITIES

None

SCHEDULE OF DRAWINGS

COVER

LIFE SAFETY

LS1.0 CODE SUMMARY
LS1.1 LIFE SAFETY INFORMATION
LS1.1.1 FIRE RESISTANCE ASSEMBLIES
LS1.1.2 FIRE RESISTANCE ASSEMBLIES
LS1.1.3 FIRE RESISTANCE ASSEMBLIES
LS2.1.1 FIRST FLOOR LIFE SAFETY PLANS
LS2.1.2 SECOND FLOOR LIFE SAFETY PLANS
LS2.1.3 ATTIC LIFE SAFETY PLANS

ARCHITECTURAL

A0.1 GENERAL ARCHITECTURAL INFORMATION
A0.2 WALL/PARTITION TYPES, WALL JOINTS AND TERMINATIONS
A1.2.1a FIRST FLOOR DEMOLITION PLAN
A1.2.2a SECOND FLOOR DEMOLITION PLAN
A2.0.0 CRAWLSPACE PLAN – OVERALL
A2.0.1 FIRST FLOOR PLAN – OVERALL
A2.0.2 SECOND FLOOR PLAN - OVERALL
A2.0.3 ATTIC FLOOR PLAN – OVERALL
A2.1.1 FIRST FLOOR PLAN – AREA A
A2.1.2 FIRST FLOOR PLAN – AREA B
A2.1.3 SECOND FLOOR PLAN – AREA A
A2.1.4 SECOND FLOOR PLAN – AREA B
A2.1.5 ATTIC FLOOR PLAN – AREA A
A2.1.6 ATTIC FLOOR PLAN – AREA B
A3.0.1 FINISH SCHEDULE
A3.0.2 FIRST FLOOR ACCENT FINISH PLANS
A3.0.3 SECOND FLOOR ACCENT FINISH PLANS
A3.0.4 INTERIOR SIGNAGE
A3.1.1 DOOR FRAME AND SCHEDULE

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

A3.2.1	DOOR AND FRAME DETAILS
A4.2.1	DETAILS AND ENLARGED ELEVATIONS
A6.1.1	ELEVATOR PLAN DETAILS
A6.1.2	STAIR DETAILS
A7.4.1	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.2	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.3	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.4	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.5	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.6	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.7	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.8	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.9	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.10	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.11	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.12	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.13	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.14	ENLARGED LAB PLANS AND ELEVATIONS
A7.4.15	ENLARGED LAB PLANS AND ELEVATIONS
A8.1.1	MILLWORK ELEVATIONS AND DETAILS
A9.1.1	REFLECTED CEILING PLAN – FIRST FLOOR PLAN AREA A
A9.1.2	REFLECTED CEILING PLAN – FIRST FLOOR PLAN AREA B
A9.1.3	REFLECTED CEILING PLAN – SECOND FLOOR PLAN AREA A
A9.1.4	REFLECTED CEILING PLAN – SECOND FLOOR PLAN AREA B
A10.1.1	ROOF PLAN
A10.2.1	ROOF DETAILS
A10.2.2	ROOF DETAILS

STRUCTURAL

S2.1.1	BOTTOM CHORD FRAMING PLAN - WEST
S2.1.2	BOTTOM CHORD FRAMING PLAN - EAST
S2.1.3	TOP CHORD FRAMING PLAN - WEST
S2.1.4	TOP CHORD FRAMING PLAN - EAST
S2.2.5	3D VIEWS
S4.1.1	FRAMING SECTIONS
S4.1.2	FRAMING SECTIONS
S5.1.1	MOMENT FRAME ELEVATIONS
S5.1.2	MOMENT FRAME ELEVATIONS

PLUMBING

P0.1	LEGENDS, ABBREVIATIONS AND GENERAL NOTES
P1.0.A	FOUNDATION PLAN – AREA A – DEMOLITION
P1.0.B	FOUNDATION PLAN – AREA B – DEMOLITION
P1.1.A	FIRST FLOOR PLAN – AREA A – DEMOLITION
P1.1.B	FIRST FLOOR PLAN – AREA B – DEMOLITION
P1.2.A	SECOND FLOOR PLAN – AREA A – DEMOLITION
P1.2.B	SECOND FLOOR PLAN – AREA B – DEMOLITION
P1.3	ATTIC FLOOR PLAN - DEMOLITION
P2.0.A	FOUNDATION PLAN – AREA A – PLUMBING
P2.0.B	FOUNDATION PLAN – AREA B – PLUMBING

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

P2.1.A FIRST FLOOR PLAN – AREA A – PLUMBING
P2.1.B FIRST FLOOR PLAN – AREA B – PLUMBING
P2.2.A SECOND FLOOR PLAN – AREA A – PLUMBING
P2.2.B SECOND FLOOR PLAN – AREA B – PLUMBING
P2.3 ATTIC FLOOR PLAN – PLUMBING
P2.4.A ROOF PLAN – AREA A – PLUMBING
P2.4.B ROOF PLAN – AREA A – PLUMBING
P4.1 ENLARGED PLANS – DEMOLITION
P4.2 ENLARGED PLANS
P4.3 ENLARGED PLANS
P5.1 DETAILS
P6.1 SCHEDULES
P9.1 GAS PIPING DIAGRAM

FIRE PROTECTION

FP0.1 LEGENDS, ABBREVIATIONS AND GENERAL NOTES
FP1.1.A FIRST FLOOR PLAN – AREA A – DEMOLITION – FIRE PROTECTION
FP1.1.B FIRST FLOOR PLAN – AREA B – DEMOLITION – FIRE PROTECTION
FP1.2.A SECOND FLOOR PLAN – AREA A – DEMOLITION – FIRE PROTECTION
FP1.2.B SECOND FLOOR PLAN – AREA B – DEMOLITION – FIRE PROTECTION
FP1.3.A ATTIC FLOOR PLAN – AREA A – DEMOLITION – FIRE PROTECTION
FP1.3.B ATTIC FLOOR PLAN – AREA B – DEMOLITION – FIRE PROTECTION
FP2.1.A FIRST FLOOR PLAN – AREA A – FIRE PROTECTION
FP2.1.B FIRST FLOOR PLAN – AREA B – FIRE PROTECTION
FP2.2.A SECOND FLOOR PLAN – AREA A – FIRE PROTECTION
FP2.2.B SECOND FLOOR PLAN – AREA B – FIRE PROTECTION
FP2.3.A ATTIC FLOOR PLAN – AREA A – FIRE PROTECTION
FP2.3.B ATTIC FLOOR PLAN – AREA B – FIRE PROTECTION

MECHANICAL

M0.1A LEGENDS, ABBREVIATIONS AND GENERAL NOTES
M0.2 SCHEDULES
M0.3 SCHEDULES
M0.4 SCHEDULES
M2.1.1 FIRST FLOOR PLAN – PART A – DUCTWORK
M2.1.2 FIRST FLOOR PLAN – PART A – PIPING
M2.2.1 FIRST FLOOR PLAN – PART B – DUCTWORK
M2.2.2 FIRST FLOOR PLAN – PART B – PIPING
M2.2.3 FIRST FLOOR PLAN – AIR BALANCE
M2.3.1 SECOND FLOOR PLAN – PART A – DUCTWORK
M2.3.2 SECOND FLOOR PLAN – PART A – PIPING
M2.4.1 SECOND FLOOR PLAN – PART B – DUCTWORK
M2.4.2 SECOND FLOOR PLAN – PART B – PIPING
M2.4.3 SECOND FLOOR PLAN – AIR BALANCE
M2.5.1 ATTIC FLOOR PLAN – PART A
M2.5.2 ATTIC FLOOR PLAN – PART B
M2.7 ROOF PLAN
M3.1 ENLARGED PLANS
M3.2 ENLARGED PLANS
M3.3 ENLARGED PLANS

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

M3.4	ENLARGED PLANS
M4.1	SECTIONS
M4.2	SECTIONS
M5.1	DETAILS
M5.2	DETAILS
M5.3	DETAILS
M5.4	DETAILS
M5.5	DETAILS
M5.6	DETAILS
M6.1	SCHEMATICS
M6.2	SCHEMATICS
M6.3	SCHEMATICS
M7.1	CONTROLS
M7.2	CONTROLS

ELECTRICAL

E0.2	LEGENDS, ABBREVIATIONS AND GENERAL NOTES
E1.1	FIRST FLOOR PLAN – PART A - ELECTRICAL DEMOLITION
E1.2	FIRST FLOOR PLAN – PART B - ELECTRICAL DEMOLITION
E1.3	SECOND FLOOR PLAN – PART A - ELECTRICAL DEMOLITION
E1.4	SECOND FLOOR PLAN – PART B - ELECTRICAL DEMOLITION
E2.1.1	FIRST FLOOR PLAN – PART A -LIGHTING
E2.1.2	FIRST FLOOR PLAN – PART A – ELECTRICAL
E2.1.4	FIRST FLOOR PLAN – PART A – MECHANICAL POWER
E2.2.1	FIRST FLOOR PLAN – PART B -LIGHTING
E2.2.2	FIRST FLOOR PLAN – PART B – ELECTRICAL
E2.2.4	FIRST FLOOR PLAN – PART B – MECHANICAL POWER
E2.3.1	SECOND FLOOR PLAN – PART A -LIGHTING
E2.3.2	SECOND FLOOR PLAN – PART A – ELECTRICAL
E2.3.4	SECOND FLOOR PLAN – PART A – MECHANICAL POWER
E2.4.1	SECOND FLOOR PLAN – PART B -LIGHTING
E2.4.2	SECOND FLOOR PLAN – PART B – ELECTRICAL
E2.4.4	SECOND FLOOR PLAN – PART B – MECHANICAL POWER
E2.5.2	ATTIC FLOOR PLAN – PART A- ELECTRICAL
E2.5.4	ATTIC PLAN – PART A – MECHANICAL POWER
E2.6.2	ATTIC FLOOR PLAN – PART B - ELECTRICAL
E2.6.4	ATTIC FLOOR PLAN – PART B – MECHANICAL POWER
E4.1	ELECTRICAL DETAILS
E4.2	LIGHTNING PROTECTION PLAN
E5.1	POWER ONE-LINE DIAGRAM
E5.2	ELECTRICAL SCHEDULES
E5.3	ELECTRICAL SCHEDULES
E5.4	ELECTRICAL SCHEDULES
E5.5	ELECTRICAL SCHEDULES
E5.6	ELECTRICAL SCHEDULES

END OF TABLE OF CONTENTS

DOBO HALL RENOVATION,
PACKAGE A - RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

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GENERAL CONDITIONS OF THE CONTRACT

STANDARD FORM FOR CONSTRUCTION MANAGER-AT-RISK PROJECTS

NORTH CAROLINA

DEPARTMENT OF ADMINISTRATION

STATE CONSTRUCTION OFFICE

Form OC-15CM

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.

Second Edition January 2013

GENERAL CONDITIONS OF THE CONTRACT

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TABLE OF CONTENTS

ARTICLE	TITLE	PAGE
1	Definitions	4
2	Intent and Execution of Documents	5
3	Clarifications and Detail Drawings	6
4	Copies of Drawings and Specifications	7
5	Shop Drawings, Submittals, Samples, Data	7
6	Working Drawings and Specifications at the Job Site	7
7	Ownership of Drawings and Specifications	7
8	Materials, Equipment, Employees	8
9	Royalties, Licenses and Patent	9
10	Permits, Inspections, Fees, Regulations	9
11	Protection of Work, Property and the Public	9
12	Sedimentation Pollution Control Act of 1973	10
13	Inspection of the Work	11
14	Construction Supervision and Schedule	12
15	{NOT USED}	13
16	Principal Trade and Specialty Contracts & Contractors	13
17	Construction Manager and Subcontractor Relationships	14
18	Designer's Status	15
19	Changes in the Work	16
20	Claims for Extra Cost	18
21	Minor Changes in the Work	20
22	Uncorrected Faulty Work	20
23	Time of Completion, Delays, Extension of Time	20
24	Partial Utilization: Beneficial Occupancy	21
25	Final Inspection, Acceptance, and Project Closeout	21
26	Correction of Work Before Final Payment	22
27	Correction of Work After Final Payment	22
28	Owner's Right to Do Work	23
29	Annulment of Contract	23
30	Construction Manager's Right to Stop Work or Terminate the Contract	24
31	Request for Payment	24
32	Certificates of Payment and Final Payment	25
33	Payments Withheld	26
34	Minimum Insurance Requirements	27
35	Performance Bond and Payment Bond	28
36	Contractor's Affidavit	28
37	Assignments	29
38	Use of Premises	29
39	Cutting, Patching and Digging	29
40	Utilities, Structures, Signs	29

41	Cleaning Up	31
42	Guarantee	31
43	Codes and Standards	32
44	Indemnification	32
45	Taxes	32
46	Equal Opportunity Clause	33
47	Employment of the Handicapped	33
48	Asbestos-Containing Materials (ACM)	33
49	Minority Business Participation	33
50	Contractor Evaluation	34
51	Gifts.....	34
52	Auditing Access to Persons and Records	
53	North Carolina False Claims Act	
54	Termination for Convenience	

ARTICLE 1 - DEFINITIONS

- a. The **contract documents** consist of the Request for Proposal (RFP); Construction Manager's formal response to the RFP; 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 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 by and through the agency or institution named in the contract..
- c. The **designer** or **project designer** means the firm or firms of architects or engineers or both (and their consultants) which have undertaken to design the project pursuant to a contract with the Owner, (hereinafter, the "design contract").
- d. The **Construction Manager-at-Risk (CM) accepts a relationship of trust and confidence between himself and the Owner and undertakes to act as the Owner's fiduciary in the handling and opening of bids in accordance with the provisions of North Carolina General Statute (N.C.G.S.) 143-128.1.** The CM agrees to furnish his best skills and his best judgment to cooperate with the Owner and Designer for undertaking all necessary action contemplated under the contract documents to (a) establish during the design phase a Guaranteed Maximum Price (GMP) to construct the project and (b) ensure timely and quality completion of the project at a cost within the GMP. Construction Manager or CM as used in the contract documents means Construction Manager-at-Risk (CM at Risk).
- e. A **subcontractor**, as the term is used herein, shall be in the case of a principal trade contractor, a general, mechanical, electrical or plumbing contractor or in the case of a specialty contractor, a trade contractor who is not a principal trade contractor, who has entered into a direct contract with a CM, 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 as supervised by the CM.
- h. The **project** is the total construction work to be performed under the contract documents.
- i. **Construction Management Fee** shall be an all inclusive lump sum management fee which will include all Construction Manager-at-Risk home office, project site and project related costs including all Construction Manager-at-Risk overhead costs and profit.
- j. **Change order**, as used herein, shall mean a written order to the CM subsequent to the signing of the contract authorizing a change in the GMP contract. The change order shall be signed by the CM, 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 CM to proceed with the work requested by Owner prior to issuance of a formal Change Order. The field order shall be signed by the CM, designer, Owner, and State Construction Office (SCO).
- l. **Field Change**, as used herein shall mean a written approval from the Owner for the CM to proceed with work requested by the Owner to be paid for from the CM Contingency or Owner's Project Reserve within the GMP.
- m. **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).
- n. **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 CM 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 CM, or consequential damages that the Owner identified in the bid documents that may be impacted by any delay caused solely by the CM (e.g., if a multi-phased project-subsequent phases, delays in start of other projects that are dependent on the completion of this Project, extension of leases and/or maintenance agreements for other facilities).
- o. **Surety**, as used herein, shall mean the bonding company or corporate body which is bound with and for the CM, and which engages to be responsible for the CM and his acceptable performance of the work.
- p. **Routine written communications between the Designer and the Construction Manager** 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 cannot be identified as "request for information".
- q. **Clarification or Request for information (RFI)** is a request from the CM 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 CM's interpretation or understanding of the contract documents requirements in question, along with reasons for such an understanding.
- r. **Approval** means written or imprinted acknowledgement that materials, equipment or methods of construction are acceptable for use in the work.
- s. **Inspection** shall mean examination or observation of work completed or in progress to determine its compliance with contract documents.
- t. **"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 the designer and owner.

- u. **“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.
- v. **Provide** shall mean furnish and install complete in place, new, clean, operational, and ready for use.
- w. **Indicated and shown** shall mean provide as detailed, or called for, and reasonably implied in the contract documents.
- x. **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.
- y. **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.
- z. **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.
- aa. **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.
- bb. **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.
- cc. **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. 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 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 CM shall execute each copy of the response to RFP, 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 construction manager'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 CM's signature on the performance bond and the payment bond shall correspond with that on 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 CM 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 CM 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 CM electronic copies of plans and specifications. If requested by the CM, up to 30 paper copies of plans and specifications will be

provide free of charge,, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the CM shall clearly and legibly record all work-in-place that is at variance with the contract documents. Additional sets shall be furnished at cost, including mailing, to the CM at the request of the CM.

ARTICLE 5 - SHOP DRAWINGS, SUBMITTALS, SAMPLES, DATA

- a. Within fifteen (15) consecutive calendar days of the notice to proceed, a schedule for anticipated submission of all shop drawings, product data, samples, and similar submittals shall be prepared by the CM and provided 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 CM 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 CM'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 CM. 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.
- 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 CM not later than twenty (20) days from the date of receipt by the Designer, for the CM'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 by the designer shall not be construed as relieving the CM 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 error has been called to the attention of the designer in writing by the CM.

ARTICLE 6 - WORKING DRAWINGS AND SPECIFICATIONS AT THE JOB SITE

- a. The CM 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 or his authorized representative, owner or State Construction Office.
- b. The CM 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 CM and submitted to the designer upon project completion and no later than thirty (30) days after 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 CM shall, unless otherwise specified, supply & pay for all lighting, power, heat, sanitary facilities & water and shall require the Principal Trade and Specialty Contractors to, supply and pay for all labor, transportation, materials, tools, apparatus, scaffolding and incidentals necessary for the completion of his work, and to 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. The CM 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 there from, 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 CM shall furnish evidence from the the Principal Trade and Specialty Contractors 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 CM through the Principal Trade or Specialty Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the CM through the Principal Trade or Specialty Contractor has the option of using any product and manufacturer combination listed. However, the CM through the Principal Trade or Specialty 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. The CM shall be responsible for reviewing all substitution requests from Principal Trade or Specialty Contractors prior to submission to the Project Designer and Owner and shall track & monitor all such requests. Requests for substitution of materials, items, or equipment shall be submitted to the Project 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 award if it can clearly be demonstrated that it is an added benefit to the owner and the designer and the owner approves.
- e. The CM shall obtain written approval from the designer for the use of products, materials, equipment, assemblies or installation methods claimed as equal to those specified. Such approvals must be obtained as soon after contract awards as possible and before any materials are ordered.

- f. 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 conduct 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 CM 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 CM shall protect and save harmless the Owner against suit on account of alleged or actual infringement. The CM 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 CM 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 CM observes that the drawings and specifications are at variance therewith, he shall promptly notify the Designer in writing. Any necessary changes required after contract award shall be made by change order in accordance with Article 19. If the CM performs any work or authorizes any work to be performed 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 there from. 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 CM unless otherwise specified.
- c. 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 CM shall, however, cooperate with the county or municipal authorities by obtaining building permits. Permits shall be obtained at no cost.
- d. Projects involving local funding (Community Colleges) are also subject to county and municipal building codes and inspection by local authorities. The CM shall pay the cost of these permits and inspections unless otherwise specified.

ARTICLE 11 - PROTECTION OF WORK, PROPERTY AND THE PUBLIC

- a. The CM shall be 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. The CM 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. The CM shall be responsible for and pay for any damages caused to the Owner. The CM shall have access to the project at all times.

- b. The CM shall be responsible to 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. 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.
- d. The CM shall ensure that all trees and shrubs designated to remain in the vicinity of the construction operations are protected in accordance with the requirements of the plans and specifications. All walks, roads, etc., shall be barricaded 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 CM shall develop and implement a project safety plan that provides 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. The CM shall clearly mark or post signs warning of hazards existing, and shall barricade excavations, elevator shafts, stairwells and similar hazards. The CM shall insure that protection is provided against damage or injury resulting from falling materials and that all protective devices and signs be maintained throughout the progress of the work.
- f. The CM 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 N.C.G.S. 95-126 through 155.
- g. The CM 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 an emergency affecting the safety of life, the protection of work, or the safety of adjoining properties, the CM 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 CM 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 CM or any Principal Trade or Specialty Contractor 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 CM 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 CM 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 CM 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 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 CM shall therefore provide safe access to the work at all times for such inspections.
- b. All instructions to the CM 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 CM.
- c. The CM shall perform quality control inspections on the work of Principal Trade and Specialty Contractors to guard the Owner against defects and deficiencies in the work and shall coordinate this activity with the on-site duties of the Project Designer. The CM shall advise the Project Designer of any apparent variation and/or deviation from the intent of the Contract Documents and shall take the necessary action to correct such variations and deviations.
- d. All work shall be inspected by designer, special inspector and/or State Construction Office prior to being covered by the contractor. The CM shall give a minimum two weeks notice unless otherwise agreed to by all parties. If inspection fails, after the first re-inspection all costs associated with additional re-inspections shall be borne by the CM.
- e. Where special inspection or testing is required by virtue of any state laws, instructions of the designer, specifications or codes, the CM shall give adequate notice to the Project Designer of the time set for such inspection or test, if the inspection or test will be conducted by a party other than the Project Designer. Such special tests or inspections will be made in the presence of the Project Designer, or his authorized representative, and it shall be the CM's responsibility to serve ample notice of such tests.

- f. All laboratory tests shall be paid by the Owner unless provided otherwise in the contract documents except the CM 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.
- g. Should any work be covered up or concealed prior to inspection and approval by the Project Designer and/or (SCO) such work shall be uncovered or exposed for inspection, if so requested by the Project Designer or SCO in writing. Inspection of the work will be made promptly upon notice from the CM. 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 CM.

ARTICLE 14 - CONSTRUCTION SUPERVISION AND SCHEDULE

- a. On-site representatives of the CM shall manage the work of the Principal Trade and Specialty Contractors and coordinate the work with the activities of the Owner and Project Designer to complete the project with the Owner's objectives of cost, time and quality. Throughout the progress of the work, the CM shall maintain a competent and adequate full-time staff approved by the Owner and Project Designer. It is understood that the designated and approved on-site representative of the CM will remain on the job and in responsible charge as long as those persons remain employed by the CM unless otherwise requested or agreed to by the Owner. The CM shall establish an on-site organization with appropriate lines of authority to act on behalf of the CM. Instructions, directions or notices given to the designated on-site authority shall be as binding as if given to the CM. However, directions, instructions, and notices shall be confirmed in writing.
- b. The CM 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. The CM shall call and preside over monthly job site progress conferences. All Principal Trade and Specialty Contractors shall be represented at these job progress conferences by both home office and project personnel. The CM shall require attendance from other subcontractors and material suppliers 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. The CM shall be prepared to assess progress of the work and to recommend remedial measures for correction of progress as may be appropriate. The CM with assistance from the Designer shall be the coordinator of the conferences and shall preside as chairman. The CM 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.
- d. The CM 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 nearby in a location where same will not be disturbed and where direct instruments sights may be taken.

- e. Prior to bidding, it shall be the responsibility of the CM to prepare an electronic and paper copy of a preliminary critical path method (CPM) schedule and submit such schedule to the Project Designer for his review and comment in sufficient time to allow revisions prior to inserting said schedule into the Principal Trade and Specialty Contractors' bid packages. After contract award but prior to thirty (30) days from the date of the notice to proceed, the CM shall obtain from the Principal Trade and Specialty Contractors their respective work activities and integrate them into a project construction schedule in CPM form. The resulting CPM schedule shall show all salient features of the work required for construction of the project from start to finish within the time allotted by the contract. The time in days between the CM's early completion date and the contractual completion date is project float time and shall be used as such by the CM unless amended by change order. The CM shall submit to the Project Designer an electronic and paper copy of the final CPM schedule after contracts are executed but within fifteen (15) days prior to the written notice to proceed. The Project Designer after reviewing and commenting on the project CPM schedule shall submit it to the Owner for approval. No application for payment will be processed until the project CPM schedule is approved by the Owner. No monthly application for payment will be processed without the submission of an electronic and paper copy of the CPM schedule attached.
- f. The CPM schedule shall be a complete computer generated network analysis showing the complete sequence of construction activities, identifying the work of separate stages and other logically grouped activities, indicating early and late start and early and late finish dates, float duration and a complete logic. Monthly updates will show the estimated completion of each activity.
- g. The CM shall distribute to the principal trade and specialty contractors the approved project CPM schedule and shall display same at the job site.
- h. The CM shall maintain the project CPM schedule, making monthly adjustments, updates, corrections, etc., which are necessary to finish the project within the time allotted by the contract. In doing so, the CM shall keep the designer as well as all Principal Trade and Specialty Contractors fully informed as to all changes and updates to the schedule. The CM shall submit to the Project Designer a monthly report of the status of all work activities. The monthly status report shall show the actual work completed to date in comparison with the original amount of work scheduled. If the work is behind schedule, the CM must indicate in writing what measures are being taken to bring the work back on schedule and ensure that the contract completion date is not exceeded. If the work is greater than thirty (30) days behind schedule and no legitimate requests for time extensions are in process, then the CM shall prepare and submit to the Project Designer a recovery schedule for review and approval. Failure of the CM to abide by the directives in this paragraph will give the Owner cause to exercise the remedies set forth in Article 29 of the General Conditions and pursue any other legal remedies allowed it by law.

ARTICLE 15 – {NOT USED}

ARTICLE 16 - PRINCIPAL TRADE AND SPECIALTY CONTRACTS AND CONTRACTORS

- a. Principal Trade and Specialty Contractors shall be pre-qualified by the CM. The prequalification criteria shall be determined by the Owner and CM to address quality, performance, the time specified in the bids for performance of the contract, the cost of construction oversight, time for completion, capacity to perform, and any other factors deemed appropriate by the Owner and/or CM. Basic qualification information from Principal Trade and Specialty Contractors shall be requested on the standard State of North Carolina

Prequalification Form approved by the State Building Commission. Only pre-qualified contractors are allowed to bid to and contract with the CM on a project.

- b. All bids for Principal Trade and Specialty Contracts shall be publically advertised and shall be opened publically in a public venue, and once opened, shall be public records under N.C.G.S. 132. The CM shall award the contract to the lowest responsible, responsive bidder, taking into consideration quality, performance, the time specified in the bids for performance of the contract, the time for completion, compliance with N.C.G.S. 143-128.2, and other factors deemed appropriate by the Owner and advertised as part of the bid solicitation. When contracts are awarded pursuant to this section, the Owner shall provide for a dispute resolution procedure as provided by N.C.G.S. 143-128(f1). Once Principal Trade and Specialty Contractors are in place, the CM shall provide copies of the contracts to the Project Designer and also provide a list of equipment and material suppliers.
- c. A CM may perform a portion of the work only if (a) bidding produces no responsible, responsive bidder for that portion of the work, or (b) the lowest responsible, responsive bidder will not execute a contract for the bid portion of the work, or the Principal Trade or Specialty Contractor defaults and a prequalified replacement cannot be obtained in a timely manner, and (c) the Owner approves performance of the work by the CM.
- d. The Designer will furnish to any Principal Trade or Specialty Contractor, upon request, evidence regarding amounts of money paid to the CM on account of the work of the Principal Trade or Specialty Contractor.
- e. The CM is and remains fully responsible for his own acts or omissions as well as those of any Principal Trade or Specialty Contractor or of any employee of either. The CM agrees that no contractual relationship exists between the Principal Trade and Specialty Contractors and the Owner in regard to the contract, and that the Principal Trade and Specialty Contractors act on this work as an agent or employee of the CM.

ARTICLE 17 - CONSTRUCTION MANAGER AND SUBCONTRACTOR RELATIONSHIPS

The CM agrees that the terms of these contract documents shall apply equally to each Principal Trade and Specialty Contractor as to the CM, and the CM agrees to take such action as may be necessary to bind each Principal Trade and Specialty Contractor to these terms. The CM further agrees to conform to the Code of Ethical Conduct as adopted by the Associated General Contractors of America, Inc., with respect to CM-subcontractor relationships, and that payments to Principal Trade and Specialty Contractors shall be made in accordance with the provisions of N.C.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 N.C. G.S. 136-28.1, the balance due the CM 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 CM, 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. Should final

payment to the CM beyond the date such contracts have been certified to be completed by the Project Designer, 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 CM 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 the CM during construction shall be paid in accordance with the payment provisions of the contract documents or said CM 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 CM of each periodic or final payment, the CM shall pay the Principal Trade and Specialty Contractors based on work completed or service provided under their contract with the CM. Should any periodic or final payment to a Principal Trade or Specialty Contractor be delayed by more than seven days after receipt of periodic or final payment by the CM, the CM shall pay the Principal Trade or Specialty Contractor 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 CM to the Principal Trade and Specialty Contractors shall not exceed the percentage of retainage on payments made by the Owner to the CM. Any percentage of retainage on payments made by the CM to the Principal Trade or Specialty Contractors that exceeds the percentage of retainage on payments made by the Owner to the CM shall be subject to interest to be paid by the CM to the Principal Trade or Specialty Contractor at the rate of one percent (1%) per month or fraction thereof.
- d. Nothing in this section shall prevent the CM at the time of application and certification to the Owner from withholding application and certification to the Owner for payment to a Principal Trade or Specialty Contractor for unsatisfactory job progress; defective construction not remedied; disputed work; third-party claims filed or reasonable evidence that claim will be filed; failure of the Principal Trade or Specialty Contractor to make timely payments for labor, equipment and materials; damage to CM or another subcontractor; reasonable evidence that a Principal Trade or Specialty Contract 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 Project Designer shall provide 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 stop work or to order work removed, or to order corrections of faulty work where such action may be necessary to assure successful completion of the work.
- b. The Project 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 CM, taking sides with neither.

- c. Should the Project 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 Project Designer.
- d. The Project Designer will make periodic inspections of the project at intervals appropriate to the stage of construction. He will inspect the progress, the quality and the quantity of the work.
- e. The Project Designer and the Owner shall have access to the work whenever it is in preparation and progress during normal working hours. The CM shall provide facilities for such access so the Designer may perform his functions under the contract documents.
- f. Based on the Project Designer's inspections and evaluations of the project, the Project Designer shall issue interpretations, directives and decisions as may be necessary to assist the CM in the administration of the project. His decisions relating to artistic effect and technical matters shall be final, provided such decisions are within the limitations of the contract. The CM's decisions, however, relating to means and methods, and administration of the contracts the CM holds are final.

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 CM 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 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.

The CM may be requested to make a change to the work by the Project Designer and Owner where such work is to be funded by the CM Contingency or Project Reserve that is part of the GMP contract. Such a change must be documented in the same manner as a Change Order and must be authorized in writing by the Project Designer and Owner by a Field Change document.

In the event of emergency endangering life or property, the CM may be directed to proceed on a time and material basis whereupon the CM shall proceed and keep accurately on such form as may be required, 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, the CM and Principal Trade and Specialty 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, 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 for a Principal Trade or Specialty Contractor and all multi-tier subcontractors shall not exceed fifteen percent (15%) of **net cost** of the work. No allowance for overhead and profit will be allowed for the CM until the change orders aggregate to a sum in excess of five percent (5%) of the Cost of the Work portion of the GMP. Once this threshold is met the CM may add an overhead & profit allowance not to exceed four percent (4%) of the net cost of the change order. Change orders to the GMP which authorize additional phases of a project without a change in scope of the originally intended project will not be considered in establishing the threshold for additional CM overhead & profit. 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 project;
 2. The actual costs of labor expended 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 project;
 5. The actual costs of premiums for bonds, insurance, permit fees and sales or use taxes related to the project.

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 breakdown showing method of arriving at net cost as defined above.

- g. In all change orders, the procedure will be for the Project Designer to request proposals for the change order work in writing. The CM will require the Principal Trade and Specialty Contractors to provide such proposals and supporting data in suitable format and will review and approve such change orders prior to submission to the designer. The Project Designer shall verify correctness. Within fourteen (14) days after receipt of the CM's proposal, the Project Designer shall prepare the change order and forward to the CM for his signature or otherwise respond, in writing, to the CM's proposal. Within seven (7) days after receipt of the change order executed by the CM, the Project 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. Upon approval by the State Construction Office, one copy remains with the State Construction Office, and the remaining copies are sent to the Project Designer for distribution to the Owner(s), CM and the surety. 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 CM 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 CM's terms are unacceptable, the Owner, with the approval of the State Construction Office, may require the CM to perform such work on a time and material basis in accordance with paragraph "b" 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 CM consider that as a result of any instructions given in any form 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 CM 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 will 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 CM shall not act on instructions received by him from persons other than the Project Designer, and any claims for extra compensation or extension of time on account of such instruction will not be honored. The Project Designer will not be responsible for misunderstandings claimed by the CM 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 CM be denied by the Project Designer or Owner, and cannot be resolved by a representative of the State Construction Office, the CM may request a mediation in connection with N.C.G.S. 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 CM is unable to resolve its claims as a result of mediation, then the CM may pursue his claim in accordance with the provisions of N.C.G.S. 143-135.3, or G.S. 143-135.6 where Community Colleges are the owner, and the following:
 1. A CM who has not completed a contract with a state agency or institution 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 CM 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 N.C.G.S. Chapter 150B.
 2. (a) A CM who has completed a contract with a State agency or institution 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 CM claims is due. The claim shall be submitted within sixty (60) days after the CM 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 CM agree. The CM 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 CM a written statement of the Director's decision on the CM's claim.
 - (c) A CM 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 CM 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 Project 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 CM.

ARTICLE 22 - UNCORRECTED FAULTY WORK

Should the correction of faulty or damaged work be considered inadvisable or inexpedient by the Owner and the Project Designer, the Owner shall be reimbursed by the CM. 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 final completion date will be as determined by the Owner, Designer and CM during the pre-construction phase of the project and will be incorporated into the contract for construction services between the Owner and the CM.
- b. The CM shall commence work to be performed under this agreement on a date to be specified in a written Notice to Proceed from the Project Designer and shall fully complete all work hereunder within the time of completion specified. For each day in excess of the above number of days, the CM 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 the CM to complete the work within the time specified, such time being in the essence of this contract and a material consideration thereof.
- c. If the CM is delayed at any time in the progress of his work by any act or negligence of the Owner or the Project Designer, or by any employee of either; 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 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 CM 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.

- d. 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 CM shall notify the designer copies to the owner and SCO, of the delay within twenty (20) days of the beginning of the delay and only one claim is necessary.
- e. The CM shall notify his surety in writing of extension of time granted.
- f. No claim shall be allowed on account of failure of the Project 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 when the work is substantially complete.
- 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.
 - 3. Contractor will obtain consent of surety.
 - 4. Contractor will obtain endorsement from insurance company permitting beneficial occupancy.
- c. The Owner shall have the right to exclude the CM from any part of the project which the Project Designer has so certified to be substantially complete, but the Owner will allow the CM 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 CM 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 CM that the project is complete and ready for inspection, the Project 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 CM shall ensure that all items requiring corrective measures noted at the designer final inspection are complete.

The Project Designer shall schedule an SCO final inspection at a time and date acceptable to the Owner, the CM and the 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 the following determinations:
 - 1. That the project is completed and accepted.
 - 2. That the project is 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.
 - 3. That the project is not complete and another date for a final inspection will be established.
- c. Within fourteen (14) days of acceptance per Paragraph c1 or within fourteen (14) days after completion of punch list per Paragraph c2 above, the Project 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 c1 or c2 above shall be handled in accordance with Article 42.
- e. The date of acceptance will establish the following:
 - 1. The beginning of guarantees and warranties period.
 - 2. The date on which the CM'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 CM (if applicable).
- f. **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 CM, and shall be immediately replaced by new work in accordance with the contract at no additional cost to the Owner. Work or property of the Owner, damaged or destroyed by virtue of such faulty work, shall be made good at the expense of the CM.
- b. Correction of condemned work described above shall commence within twenty-four (24) hours after receipt of notice from the Project Designer, and shall make satisfactory progress until completed.

- c. Should the CM 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 Project Designer, shall relieve the CM from responsibility for negligence, or faulty material or workmanship, or failure to comply with the drawings and specifications. The CM shall correct or make good any defects due thereto and repair any damage resulting therefrom, 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 CM and establish a time limit for completion of corrections by the CM. 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 CM 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 CM 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 CM, such action and cost of same having been first approved by the Project Designer. Should the cost of such action of the Owner exceed the amount due or to become due the CM, then the CM 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 CM fails to begin the work under the contract within the time specified or fails to establish a GMP or obtain bids from or enter into contracts with qualified Principal Trade or Specialty Contractors within the GMP, 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 CM 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 CM and his surety of such delay, neglect or default, specifying the same, and if the CM 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 CM, 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 CM 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 CM, then the said CM 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 CM and the surety shall be liable and shall pay to the Owner the amount of said excess.

ARTICLE 30 – CONSTRUCTION MANAGER’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 CM, 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 CM, 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 CM for the cost of all materials delivered and work performed on this contract plus ten (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 CM 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 CM 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 CM'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. Prior to submitting the first payment request, the CM shall prepare a schedule showing a breakdown of the contract price into values of the various parts of the GMP contract. The Cost of the Work breakdown will be arranged so as to facilitate payments to the Principal Trade and Specialty Contractors in accordance with Article 17. The combined CM Construction Management Fee, Bonds & Insurance, CM Contingency, and Project Reserve (if any) will be shown on the Schedule of values as separate lines. The values for the CM Contingency and Project Reserve (if any) will move to appropriate lines within the Cost of the Work as those funds are committed and expended. This schedule of values will be submitted to & approved by the designer and Owner within 30 days of the Notice to Proceed.

The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the designer and Owner may require.

- c. Applications for payment shall be in a form agreed upon by the CM, designer and Owner and shall be prepared and supported by such data to substantiate the accuracy of the request as the designer may require.
- d. Subject to other provisions of the contract documents, the amount of each progress payment shall be computed as follows:
 - 1. Take that portion of the GMP properly allocable to completed work as determined by multiplying the percentage completion of each portion Cost of the Work by the share of the GMP allocated to that portion of the work in the schedule of values.
 - 2. Add that portion of the GMP properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the work or if approved in advance by the Owner, suitably stored off site at a location agreed upon in writing.
 - 3. Subtract the aggregate of previous payments made by the Owner.
 - 4. Subtract the amount, in any, by which the CM has been previously overpaid, as evidenced by the Owner's review of the CM's documentation.
 - 5. Subtract amounts, if any, for which the Project Designer has withheld or nullified a certificate of payment.
 - 6. Subtract retainage as per paragraph (h) below.
 - 7. Add the amount due for the CM Construction Management Fee calculated on the basis the percentage completion of the project or on a schedule of payment negotiated with the Owner less fifteen percent (15%) and less previous payments for CM Construction Management Fee.
- e. Payment allocated to Principal Trade and Specialty Contractors shall be subject to five percent (5%) retainage, provided, however that after fifty percent (50%) of the Cost of the Work has been satisfactorily completed on schedule, with the approval of the Owner and the State Construction Office and with 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. The balance of the CM Construction Management Fee shall be held by the Owner until satisfactory completion and close out of the project. Satisfactory completion and close out of the project means that the Owner and Project Designer are satisfied that the project has been completed in accordance with the plans and specifications and within the GMP, all general conditions of the contract pertaining to close out have been satisfied, and all Principal Trade and Specialty Contractors have satisfactorily completed their respective contracts. No retainage will be held for the cost of Bonds and Insurance
- f. 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 CM 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 CM, at his option, shall be permitted to store such materials and/or equipment in a suitable space off-site. Should the CM 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 CM'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 CM. 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 CM.

- g. In the event of beneficial occupancy, retainage of funds due the CM 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 CM's bonding company.

ARTICLE 32 - CERTIFICATES OF PAYMENT AND FINAL PAYMENT

- a. Within five (5) days from receipt of request for payment from the CM, 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 CM 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 CM.
 - 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 CM 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 CM 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 CM 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 contracts amounts and total actual payments to subcontractors and material suppliers.
 2. Affidavit of Release of Liens.
 3. Affidavit from CM 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 Project Designer, certificates of compliance issued, and the CM has complied with the closeout requirements. The designer shall forward the CM'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 against the CM.
- b. The Secretary of the Department of Administration may authorize the withholding of payment for the following reasons:
1. Claims filed against the CM or evidence that a claim will be filed.
 2. Evidence that Principal Trade or Specialty Contractors have not been paid.

- c. The Owner may withhold all or a portion of CM's Project Management Fee costs set forth in the approved schedule of values, if CM 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 CM without cause will make owner liable for payment of interest to the CM 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 CM has verified to the Owner that all required insurance and verifying certificates of insurance have been obtained and approved in writing by the Owner. These certificates shall contain a provision that coverage's afforded under the policies will not be cancelled, reduced in amount or coverage's 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.

a. Worker's Compensation and Employer's Liability

The CM shall ensure that it and all Principal Trade and Specialty Contractors shall provide and maintain, during the life of the contract, 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 CM shall ensure that it and all Principal Trade and Specialty Contractors shall provide and maintain, during the life of the contract, 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 CM shall ensure that it and all Principal Trade and Specialty Contractors shall purchase and maintain property insurance during the life of this contract, upon the entire work at the

site to the full insurable value thereof. This insurance shall include the interests of the Owner, the CM, and subcontractors in the work and shall insure against the perils of fire, extended coverage, and vandalism and malicious mischief. If the Owner is damaged by failure of the CM to purchase or maintain such insurance, then the CM shall bear all reasonable costs properly attributable thereto; the CM 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 CM and/or the Principal Trade or Specialty Contractor as applicable.

e. Other Insurance

The CM shall ensure that it and all Principal Trade and Specialty Contractors 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 CM shall ensure that it and all Principal Trade and Specialty Contractors 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. The CM 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, which shall be in the amount of the GMP for the entire project. Bonds shall be executed in the form bound with the 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 CM on account of the contract shall not become due until the CM 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 to Principal Trade and Specialty Contractors in connection with his contract have been satisfied, and that no claims or liens exist against the CM in connection with this contract. In the event that the CM cannot obtain similar affidavits from the Principal Trade and Specialty Contractors to protect the CM and the Owner from possible liens or claims against the subcontractor, the CM shall state in his affidavit that no claims or liens exist against any subcontractor to the best of his (the CM's) knowledge, and if any appear afterward, the CM shall save the Owner harmless.

ARTICLE 37 - ASSIGNMENTS

The CM 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 CM under the contract may be assigned.

ARTICLE 38 - USE OF PREMISES

- a. The CM 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 shall not exceed those established limits in his operations.
- b. The CM shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.
- c. The CM 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 CM shall ensure that all cutting, fitting or patching that may be required to make the work 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 Principal Trade or Specialty Contractor shall endanger any work of another such contractor by cutting, digging or other means, nor shall he cut or alter the work of any other such contractor without the consent of the designer and the affected contractor(s).

ARTICLE 40 - UTILITIES, STRUCTURES, SIGNS

- a. The CM shall provide necessary and adequate facilities for water, electricity, gas, oil, sewer, and other utility services, which may be necessary and required for completion of the project. If the Owner specifies that the CM is to pay all utilities, any permanent meters installed shall be listed in the CM's name until his work is fully accepted by the Owner. As stipulated in the Supplementary General Conditions, the Owner may: (1) pay utilities cost directly, (2) require the CM to pay all utilities cost, (3) or reimburse the CM for the actual cost of utilities. The Owner or CM, as applicable, may recover actual costs of metered utilities from the responsible party should delays occur in project completion. Coordination of the work of the utility companies during construction is the sole responsibility of the CM.
- b. If applicable Meters shall be relisted in the Owner's name on the day following completion and acceptance of the CM's work, and the Owner shall pay for services used after that date.
- c. Prior to the operation of permanent systems, the CM will provide temporary power, lighting, water, and heat to maintain space temperature above freezing, as required for construction operations.
- d. The CM shall ensure that the permanent building systems are 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 CM and the designer. Use of the equipment in this manner shall in no way affect the warranty requirements of the CM.

- e. The CM shall coordinate the work so that the building's permanent power wiring distribution system shall be in sufficient readiness to provide power as required by the HVAC contractor for temporary climatic control.
- f. The CM shall coordinate the work so that the building's permanent lighting system shall be ready at the time interior painting and finishing begins and shall provide adequate lighting in those areas where interior painting and finishing is being performed.
- g. The CM 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 acceptance of work by the State Construction Office, the CM shall coordinate the removal and replacement of 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 CM shall ensure that all lamps are in proper working condition at the time of final project acceptance.
- h. The CM 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.
- i. The CM 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.
- j. On multi-story construction projects, the CM shall either provide or ensure that temporary elevators, lifts, or other necessary special equipment is available for the general use of all contractors. The cost for such elevators, lifts or other special equipment and the operation thereof shall either be included in the CM Construction Management Fee or specified as part of the work of a Principal Trade or Specialty Contractor and paid for as a part of the Cost of the Work.

- k. The CM 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 CM's name, 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 CM shall ensure that the building and surrounding area is 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. The CM shall provide an on-site refuse container(s) for the use of all Principal Trade and Specialty Contractors. The CM shall ensure that each Principal Trade and Specialty Contractor removes their rubbish and debris from the building on a daily basis. The CM shall ensure that the building is broom cleaned as required to minimize dust and dirt accumulation.
- b. The CM shall provide and maintain suitable all-weather access to the building.
- c. Before final inspection and acceptance of the building, the CM shall ensure that all portions of the work are clean, 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 CM 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 CM 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 CM, 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 CM 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 therefrom, and (2) is caused in whole or in part by any negligent act or omission of the CM, the CM's subcontractor, or the agents of either the CM or the CM'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 from Principal Trade and specialty Contractors and contract sum.
- e. Accounting Procedures for Refund of County Sales & Use Tax

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

CM's performing contracts for state agencies shall ensure that the Principal Trade and Specialty Contractors provide information to allow the CM to give the state agency for whose project the materials, supplies, fixtures and/or equipment was purchased a signed statement containing the information listed in N.C.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 from the contractors 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 CM.

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 CM agrees not to discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant is qualified. The CM agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap 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. Construction Managers are reminded of the requirements of instructions under 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

N.C.G.S. 143-128.2 establishes a ten percent (10%) goal for participation by minority businesses in total value of work for each State building project and requires documentation of good faith efforts for meeting that goal. The document, *Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts* including Affidavits and Appendix F are hereby incorporated into and made a part of this contract.

The CM shall identify and define contract packages (the value of which shall total to at least ten percent (10%) of the GMP) that remove barriers to participation commonly experienced by Historically Underutilized Businesses and Minority Business Enterprises as those terms are defined in North Carolina General Statute 143-128.2, hereinafter referred to as Reduced Barrier Packages (RBP). Such contract packages will be submitted to the Owner for review. As an example, RBP's may require no performance or payment bond, or may offer the participation of the CM as a guarantor or surety in the financing of material purchases by the Principal Trade and/or Specialty Contractors, provided that the CM may condition such financing participation upon the

issuance of joint checks or other similar arrangements to allow the CM to verify that timely payments are made to suppliers furnishing credit. The CM may propose other and/or additional provisions for reducing barriers to participation.

The Owner shall require the CM to submit a plan for compliance with N.C.G.S.143-128.2 by approval by the Owner prior to soliciting bids for the Principal Trade and Specialty Contracts. The CM and Principal Trade and Specialty Contractors shall make a good faith effort to recruit and select minority businesses for participation in contracts pursuant to N.C.G.S. 143-128.2.

ARTICLE 50 – CONTRACTOR EVALUATION

The CM'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 compete for future capital improvement projects for institutions and agencies of the State of North Carolina. In addition to final evaluation, interim evaluation may be prepared during the progress of project. The document, Construction Manager Evaluation Procedures, is hereby incorporated and made a part of this contract. The Owner may request the CM'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 loss 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

- a. Owner may at any time and for any reason terminate CM’s services and work at Owner's convenience. Upon receipt of such notice, CM 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.
- b. Upon such termination, CM 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 CM 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 CM prior to the date of the termination of this Agreement. CM 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 OF THE CONTRACT

SUPPLEMENTARY GENERAL CONDITIONS OF THE CONTRACT

The following modify the January 2013, 2nd Edition of the GENERAL CONDITIONS OF THE CONTRACT, STATE OF NORTH CAROLINA FORM OC-15CM and supersedes them only whenever they are in conflict. Unaltered provisions of the General Conditions shall remain in effect. These modifications shall be incorporated into all Contract Forms.

ARTICLE 10- PERMITS, INSPECTIONS, FEES, REGULATIONS

"f": **Add** the following paragraph: "Notify UNCW Environmental Health and Safety (EH&S) a minimum of one (1) day in advance prior to performing work requiring a Hot Work Permit. "

ARTICLE 11- PROTECTION OF WORK, PROPERTY, AND THE PUBLIC

"j": **Add** the following paragraph: "The Contractor and the Owner shall meet on a regular basis as required but not less than weekly to coordinate safety and security issues."

ARTICLE 12- SEDIMENTATION POLLUTION CONTROL ACT OF 1973

"e": **Add** the following new paragraph: "The Contractor shall comply with the following requirements: Equipment utilized during the construction activity on a site must be operated and maintained in a manner as to prevent the potential or actual pollution of the surface or ground waters. Fuels, lubricants, coolants, and hydraulic fluids, or any other petroleum products, shall not be discharged on the ground or into surface waters. Spent fluids shall be disposed of in a manner so as not to enter the waters, surface or ground, and in accordance with applicable state and federal disposal regulations. Any spilled fluids shall be cleaned up to the extent practicable and disposed of in a manner so as not to allow their entry into the waters, surface or ground, storm sewers, or drains on private or public property. Herbicide, pesticide, and fertilizer usage during the construction activity shall be restricted to those Materials approved by EPA and shall be used in accordance with label instructions. All wastes composed of construction materials shall be disposed of in accordance with NC General Statutes, Chapter 130A, Article 9- Solid Waste Management, and rules governing the disposal of solid waste (NC Administrative Code Section 15A NCAC 13B)."

"f": **Add** the following new paragraph: "Minimum Monitoring and Reporting Requirements

All sedimentation and erosion control of facilities shall be inspected by the Engineer and/or Contractor in accordance with requirements of North Carolina Department of Environmental Quality (NCDEQ) permit issued for the project which Contractor shall have original posted at the site (Yellow Card).

If inspections required by this permit identify a need for maintenance of control measures, modifications or additions to control measures, or corrective actions to control sediment or other pollutants, these actions must be performed as soon as possible and before the next storm event to maintain the effectiveness of the control measures. The Owner reserves the right to deduct the cost of maintenance, modifications, additions or corrective actions from the Contractor's application for payment.

"g": **Add** the following new paragraph: "Maintenance and Inspections

The Contractor shall keep all erosion controls devices and materials in good repair. The Owner reserves the right, within 24 hours prior notice to the Contractor to repair any erosion control measures or materials as required, and deduct the cost of those repairs from the Contractor's application for payment.

The owner's representative may periodically evaluate the project for compliance with these requirements."

ARTICLE 14-CONSTRUCTION SUPERVISION AND SCHEDULE.

Add the following to end of sentence "d":

"In such case, the Engineer or land surveyor shall coordinate the project benchmark with known campus benchmarks."

ARTICLE 23 -TIME OF COMPLETION. DELAYS. EXTENSION.

Add the following:

"g." Time.

1. The Contractor shall commence work to be performed under this agreement on a date to be specified in a written order form the designer and shall fully complete all work within **775** consecutive calendar days from, and including said date. For each day in excess of the above number of days, the Contractor shall pay to the Owner the following sum as liquidated damages reasonably estimated in advance to cover the losses to be incurred by the Owner by reason of failure of said Contractor to complete the work within the time specified, such time being in the essence of this contract and a material consideration thereof.

- a. \$2,000.00 per day until completion.

Revise Subparagraph "c" as follows:

Add the following sentence: "Property insurance specified in Subparagraph "c" shall include the Owner, the Architect and its consultants, the Contractor and its subcontractors as additional insured parties in the policy."

ARTICLE 40 -UTILITIES. STRUCTURES. SIGNS.

Revise Subparagraph "a" to read as follows:

"The contractor shall provide necessary and adequate facilities for water, electricity, gas, oil sewer, and other utility services which may be necessary and required for completion of the project. The University owns the water, sewer, gas, telephone and electrical utilities on campus. The contractor shall arrange for and provide all appurtenances necessary for the provision of temporary services, including connections to existing utilities brought to the project site. Temporary telephone service shall be obtained and paid for by the contractor through the University's telecommunications department. Connections for all other utilities shall be performed under the supervision of Physical Plant personnel. In all cases, the contractor shall give a minimum of 72 hours' notice for the connection of all utilities.

The University shall provide temporary electric, gas and water meters on University-owned utility services to the building. The University will read the meters on a monthly basis, and will pay for the cost of consumption for these utilities. The University reserves the right to back charge the contractor if the University finds negligence in the use of utilities.

Charges for telephone and data utilities will be charged to the contractor directly by UNCW Telecommunications Department on a monthly basis. Contractor is advised to confirm current telephone and data rates with UNCW Telecommunications Department (910) 962-4019.

Add the following to item "i":

"General Contractor shall provide its own office facility including telephone required at location on site approved by the Architect and Owner. The Office shall be weather-tight with lighting, electrical outlets, heating, cooling equipment and equipped with sturdy furniture, drawing rack and drawing display table. The office shall also include a desk and telephone/data outlet. General Contractor's office shall be large enough for its own use and for use as a coordination office to include meeting space with table and chairs for 16 people.

"a": Add the following new paragraph: "It is imperative that Owner's utilities and other services be maintained at all times except for scheduled interruptions. If necessary, work shall be performed at night, over the weekend, during student breaks, or during holidays. No extra payment will be made for such work. When utility services cannot be interrupted for the length of time required, the Contractor shall make provisions for temporary services.

"h". Portable toilets must be provided on site. The Owner's toilet facilities shall not be used at any time during the project."

END OF UNCW SUPPLEMENTARY GENERAL CONDITIONS

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

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 011000 – SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Dobo Hall Renovation
- B. Owner: University of North Carolina Wilmington
- C. Architect: Moseley Architects
- D. Construction Manager: Balfour Beatty Construction
- E. Use of Professional Seals on Bidding, Procurement, and Contract Documents: or the purposes of this paragraph, the term “Regulant” refers to the individual who signs and seals parts of the Contract Documents (e.g. the Drawings and Specifications). Certain information has been excerpted verbatim from a source or sources (e.g., UL Assemblies, SMACNA details, IBC code text) which was considered or used by Regulant in preparing parts of the Contract Documents, as follows:
 - 1. The excerpted information was neither prepared under the direct control nor personal supervision nor created by the Regulant, as it was prepared by the source and owner of the excerpted information.
 - 2. For purposes of bidding, procuring, and performance of the Work, and in any event of conflicts or ambiguities between the excerpted information in the Contract Documents and the requirements of applicable codes and standards, provide the better quality or greater quantity of Work which, at a minimum, complies with the requirements of the applicable codes and standards.
 - 3. Advise Architect immediately upon becoming aware of requirements of the Work which are not consistent with the requirements of the excerpted information.
 - 4. Attribution is acknowledged for information obtained and included herein verbatim from other source or sources.
 - 5. Regulant has taken into consideration and used certain excerpted information from other sources which are applicable to the Contract Documents, and the Regulant indicates by its seal that it is assuming responsibility for its services in use and application of the excerpted information to the requirements of Work, but not for the excerpted information itself which was prepared by others. Regulant does not indicate by its seal that it is responsible for use or application of other information in such source or sources which was not included herein.

1.3 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract based on a Guaranteed Maximum Price proposal from the GCCM.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.4 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Future Work: Owner may award separate contract(s) for the following additional work to be performed at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.

1.5 USE OF PREMISES

- A. General: Contractor shall have full use of premises for construction operations as indicated on Drawings by the Contract limits.
- A. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Portions of these areas will be made available for parking or storage of materials, as directed by the University.
 - a. Schedule deliveries to minimize use of driveways and entrances.

1.6 WORK RESTRICTIONS

- A. Existing Utility Interruptions: Do not interrupt utilities serving connected facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than 2 business days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.

1.7 ADDITIVE BID ITEMS

- A. Definition: An Additive Bid Item is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each Additive Bid Item is the net addition to or deduction from the Contract Sum to incorporate Additive Bid Item into the Work. No other adjustments are made to the Contract Sum.
- B. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the Additive Bid Item into Project.
 - 1. Include as part of each Additive Bid Item, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of the Additive Bid Item.
- C. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each Additive Bid Item. Indicate if Additive Bid Items have been accepted,

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

rejected, or deferred for later consideration. Include a complete description of negotiated modifications to Additive Bid Items.

- D. Execute accepted Additive Bid Items under the same conditions as other work of the Contract.

1.8 OWNER'S OCCUPANCY REQUIREMENTS

- A. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
 3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.9 WORK RESTRICTIONS

- A. On-Site Work Hours: Work generally shall be performed during normal business working hours of 8 a.m. to 5 p.m., Monday through Friday, except as otherwise indicated.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Owner not less than five days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's written permission.

1.10 ASBESTOS STATEMENT:

- A. No asbestos-containing materials (ACMs) shall be permitted. To the best of the Architect's knowledge, no ACMs are indicated for use in construction of this Project. Certify, in writing, that no asbestos-containing materials have been included in the Project.

1.11 GENERAL REQUIREMENTS:

- A. The Contractor shall comply with UNC Wilmington's Safety Requirements for Contractors and Subcontractors Program which is incorporated by reference.
- B. It is required that the Contractor and all Subcontractors carefully phase the work to permit orderly flow of vehicular traffic during construction.
- C. Construction site access, isolation of construction operations, safety measures, and other issues will be coordinated and clarified at Pre-construction conference as outlined in the Contract Documents.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Provide security measures to protect the site construction areas during the entire contract period. Any damage to the site construction areas due to lack of security shall be repaired or replaced by the General Contractor to the satisfaction of the Owner and at no additional cost to the Owner. No increase in the completion time(s) will be allowed for any security-related problems.
- E. Coordinate and schedule security measures with the Owner.
- F. Provide self-contained toilet units in the exterior staging area. The Owner's interior building toilet facilities shall be "off-limits" to all construction personnel.
- G. After hours work shall be coordinated in advance with the Owner.
- H. Verify all existing grades, lines, levels, and horizontal and vertical dimensions, prior to commencing construction operations. Report any errors or inconsistencies to the Architect BEFORE beginning any work on this project.
- I. Provide a Rodent and Pest Management plan. Coordinate with Owner and A/E.
- J. Soil and Sediment Erosion Control: The Contractor is required to strictly observe regulations regarding erosion and sediment control procedures. If corrective action is required and not responded to within 24 hours of notice the Owner shall reserve the right to perform the work and back charge the Contractor.

1.12 PATCH AND REPAIRING:

- A. Replace all concrete walks, curbs, gutters, paving, and topsoil and seed where such is not indicated to be disturbed, where disturbed by construction work, to the satisfaction of the Owner.

1.13 DRAWINGS AND SPECIFICATIONS

- A. Provide all indicated or required equipment and materials with all features normally provided with items, although all features of design and construction may not be indicated in complete details. Include all standard features and appurtenances normally provided and/or required for safe operation.
- B. The Contractor shall be responsible for including all items and parts of the Work, as defined by requirements of the Contract Documents. Unless the Contract Documents specifically designate an item of part of the Work that is to be provided by a Subcontractor, then it is the sole responsibility of the Contractor to determine and allocate/assign the performance of each item or part of the Work. The Contractor shall not be entitled to any compensation or adjustment of time or to any other Claim due to any provision of the Contract Documents which assigns or allocates, or fails to assign or allocate, the performance of any item or part of the Work to any specific Subcontractor of Contractor. In no event shall the Contractor be entitled to request an interpretation or decision by, or any determination or instruction from, the Architect concerning or about any assignment or allocation of parts of the Work. The Architect will not be responsible to arbitrate or otherwise resolve any dispute or differences about such allocation or assignment between Contractor and any Subcontractors.
- C. "Summary" and "Related Sections" provisions in the Specifications, if any are stated or referred to in any Specification, are provided only for general reference and for convenience, and do not limit or alter in any way the requirements for the provision of the Work in the Contract Documents. Items or parts of the Work, and related provisions of the Contract Documents, even though not listed or stated in any Summary or Related Section provision, but which are indicated

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

elsewhere in the Contract Documents, shall be included in the Work. Even though a Summary or Related Section may not refer to, state, or list each and every part of the Contract Documents which may include provisions about a specific item or part of the Work, all of the other applicable provisions of the Contract Documents remain in full force and effect, and shall be included in determining the requirements for the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 SUBMITTALS

- A. Substitution Requests: Contractor shall request and submit a "Substitution Request Form – After Receipt of Bids" for all substitutions to be considered after receipt of bids.
1. Substitution Request Form: Use the Architect's form, which can be obtained from the Architect at the time of the request.
 - a. The form is an electronic Word document requiring the Contractor to fill in "data fields."
 - b. A copy of the form is attached to the end of this Section for informational purposes only. Use the electronic Word document only.
 2. No substitutions will be considered unless submitted using the referenced "Substitution Request Form – After Receipt of Bids."
 3. All substitutions must be submitted by the Contractor, and shall include the Contractor's certification and signature.
 - a. Substitution requests submitted directly from subcontractors, sub-subcontractors, manufacturers, vendors, installer, and suppliers will be rejected.
 4. Failure to submit the form, or a fully completed form, shall result in the rejection of the proposed substitution; and shall also include:
 - a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will be necessary to accommodate proposed substitution.
 - b. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- c. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. Certificates and qualification data, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research reports evidencing compliance with building code in effect for Project.
 - i. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- 5. If the proposed substitution is found to be acceptable to the Architect, the request will be forwarded to the Owner for their approval.
 - 6. If the Owner approves the substitution, it will then be included in a Change Order or Construction Change Directive.
 - 7. Only substitutions included in Change Orders or Construction Change Directives shall be allowed to be included in the Work
 - 8. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed.
 - a. Forms of Acceptance: Change Order or Construction Change Directive only.

1.4 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

- A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 21 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when all of the following conditions are satisfied. If all of the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- A. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after Award of Construction Contract. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when all of the following conditions are satisfied. If all of the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume.
 - 1) Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Above-ceiling coordination conference and coordination drawings.
 - 3. Requests for Information (RFIs).

1.3 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.

1.6 ABOVE-CEILING PRE-CONSTRUCTION CONFERENCE AND COORDINATION DRAWINGS

- A. Coordination Drawings (Optional): Prior to the Above-Ceiling Pre-Construction Conference, prepare drawings where limited space availability necessitates maximum utilization of space for the proper and efficient installation of the components, materials, and systems (including, but may not be limited to: above finish ceilings; within chases and shafts; and within mechanical and electrical spaces).
 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Ensure components, materials, and systems are indicated where each are fully functional, operational, accessible, and complete.
 - b. Indicate relationships of components, materials, and systems with surrounding construction.
 - c. Indicate installation sequences to avoid conflicts
 - d. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
 3. Number of Copies: Submit two opaque copies. Architect will return one copy.
 - a. Coordination Drawings will not be approved by the Architect and will be considered as "information only" and will be furnished to the Owner for filing.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- b. Submit five copies where Coordination Drawings are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.
 - 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
 - B. Above-Ceiling Pre-Construction Conference: Schedule and conduct with all affected parties present to review procedures for addressing potential conflicts, review of Coordination Drawings (if furnished) and obtain approval of each affected trade to ensure components, materials, and systems can be installed as intended prior to the Work being performed.
 - 1. Identify Above-Ceiling Pre-Construction Conference on the Construction Schedule as a “milestone” date.
 - 2. Advise the Architect of potential conflicts identified in the Coordination Drawings (if furnished) and Above-Ceiling Pre-Construction Conference.
 - 3. Do not proceed with construction or installation of the components, materials, and systems until potential conflicts identified have been resolved and affected parties have agreed to a remedy.
 - C. Remedies to address conflicts not identified in the Coordination Drawings (if furnished), Above-Ceiling Pre-Construction Conference, or otherwise addressed prior to construction or installation of the affected components, materials, and systems; or discovery of a non-workable situation without Coordination Drawings on file with the Owner, will not be considered as a basis of delay, time extension, or additional cost to the Contract.
- 1.7 REQUESTS FOR INFORMATION (RFIs)
- A. General: Immediately on discovery of the need for additional information or interpretation of Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 - B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Name of Contractor.
 - 5. Name of Architect.
 - 6. RFI number, numbered sequentially.
 - 7. RFI subject.
 - 8. Specification Section number and title and related paragraphs, as appropriate.
 - 9. Drawing number and detail references, as appropriate.
 - 10. Field dimensions and conditions, as appropriate.
 - 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
 - C. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
 1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to **conditions of the Contract**.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10days of receipt of the RFI response.
 - D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log **at intervals as established**. Software log with not less than the following:
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 - E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- 1.8 PROJECT MEETINGS
- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: The Architect will prepare the meeting agenda and distribute it to all invited attendees.
 3. Minutes: The Architect will record significant discussions and agreements achieved. Within 7 days of the meeting the Architect will distribute the meeting minutes to the Owner, the Architect's consultants, and to the Contractor for distribution to his personnel and attending major subcontractors, manufacturers, suppliers and other concerned parties.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement **in compliance with Section 50(b) of the General Conditions**. Hold the conference at Project site or another convenient location. The Architect shall conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, **Owner's Commissioning Authority**, **Owner's Project Inspector(s)**, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. **The following discussion topics shall be in addition to those listed in the General Conditions:**
 - a. Tentative construction schedule.
 - b. Critical work sequencing and long-lead items.
 - c. Designation of key personnel and their duties.
 - d. Lines of communications.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. **Sustainable design requirements.**
 - l. Air barrier requirements.
 - m. NFPA 285 requirements.
 - n. Coordination and submittal of color & finish related selections.
 - o. Preparation of record documents.
 - p. Use of the premises and existing buildings.
 - q. Work restrictions.
 - r. Working hours.
 - s. Owner's occupancy requirements.
 - t. Responsibility for temporary facilities and controls.
 - u. Procedures for moisture and mold control.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- v. Procedures for disruptions and shutdowns.
- w. Construction waste management and recycling.
- x. Parking availability.
- y. Office, work, and storage areas.
- z. Equipment deliveries and priorities.
- aa. First aid.
- bb. Security.
- cc. Progress cleaning.

3. Minutes: Architect will record, and Contractor will distribute meeting minutes.

C. Sustainable Design Orientation and Q&A Sessions:

- 1. Schedule: Schedule a Sustainable Design Orientation session at the Project site or other convenient location no later than fifteen (15) days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments. This session may be included in the pre-construction conference if time permits.
- 2. Attendees: The Owner, Architect, Civil Engineer, Mechanical/Electrical/Plumbing Engineer, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
- 3. Agenda:
 - a. Overview of the Sustainable Design Rating System
 - b. Question and Answer session

D. Construction Waste Management (CWM) Plan Development Session:

- 1. Schedule: Schedule a Construction Waste Management planning session at the Project site or other convenient location no later than fifteen (15) days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- 2. Attendees: The Owner, Architect, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
- 3. Agenda:
 - a. Discussion of waste to be generated during demolition
 - 1) Discussion of how waste can be reduced, recycled, reused, or donated
 - 2) Identify wastes that must be landfilled
 - 3) Quantify amounts of waste in each category
 - b. Discussion of waste to be generated during construction and renovations
 - 1) Discussion of how waste can be reduced, recycled, reused, or donated
 - 2) Identify wastes that must be landfilled
 - 3) Quantify amounts of waste in each category
 - c. Discussion of how and where waste is to be separated on site

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- d. Discussion of how recycling, material reuse, donation, and landfilling rates will be tracked and reported for each category
- E. Construction Indoor Air Quality (IAQ) Management Plan Development Session: (Refer to Division 1 section "Indoor Air Quality Requirements.")
 - 1. Schedule: Schedule a Construction Indoor Air Quality Management planning session at the Project site or other convenient location no later than forty-five (45) days after execution of the Agreement and prior to commencement of wall assembly construction activities. Conduct the meeting to review responsibilities and personnel assignments.
 - 2. Attendees: The Owner, Architect, Mechanical Engineer, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
 - 3. Agenda:
 - a. Protection: Discussion of how and where materials that could impact IAQ will be stored, including but not limited to:
 - 1) Insulation
 - 2) Gypsum board
 - 3) Flooring materials
 - 4) Ceiling panels
 - 5) Furnishings
 - 6) Odorous chemicals
 - b. Protection: Discussion of how HVAC equipment will be stored, installed, and operated during construction
 - c. Source Control: Discussion of the selection of building materials that can contaminate indoor air, including but not limited to:
 - 1) Adhesives
 - 2) Sealants
 - 3) Paints
 - 4) Carpets
 - 5) Composite wood
 - d. Pathway Interruption: Discussion of how airflow between construction zones will be limited to prevent the spreading of pollutants from one part of the building to another.
 - e. Housekeeping: Discussion of how the building will be kept clean and dry
 - f. Scheduling: Discussion of what wet (odor emitting) materials will be used on this project, in order to schedule their installation before fuzzy (odor absorbing) materials
 - g. Scheduling: Discussion of how to ensure sufficient time to flush building out with fresh air for two (2) full weeks after construction is complete and before occupancy.
- F. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction. Contractor conducts conferences, records and distributes meeting minutes.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, **and Owner's Commissioning Authority** of scheduled meeting dates.
2. Agenda: **Contractor will** review of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. **Sustainable design requirements.**
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility requirements.
 - l. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written instructions.
 - o. Warranty requirements.
 - p. Compatibility of materials.
 - q. Acceptability of substrates.
 - r. **Air barrier requirements.**
 - s. **NFPA 285 requirements.**
 - t. Temporary facilities and controls.
 - u. Space and access limitations.
 - v. Regulations of authorities having jurisdiction.
 - w. Testing and inspecting requirements.
 - x. Installation procedures.
 - y. Coordination with other work.
 - z. Required performance results.
 - aa. Protection of adjacent work.
 - bb. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- G. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, **Owner's Commissioning Authority**, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. **Requirements for completing sustainable design documentation.**
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for delivery of material samples, attic stock, and spare parts.
 - g. Requirements for demonstration and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - j. Submittal procedures.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
 4. Minutes: Record and distribute meeting minutes.
- H. Progress Meetings: The Architect shall conduct progress meetings at semi-monthly intervals. Coordinate dates of meetings with preparation of payment requests; one of the semi-monthly progress meetings shall be the Monthly Pay Meeting, per Section 50(c) of the General Conditions.
1. Attendees: Representatives of the Owner, the Architect, and the Contractor shall be represented at each of these meetings. Design consultants, Subcontractors, suppliers, and other entities concerned with current progress or involved in planning, coordination, or performance of future activities may be invited to attend these meetings on an as needed basis to resolve specific issues. All participants at these meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
- 1) Review schedule for next period.
- b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Status of sustainable design documentation.
 - a) Documentation of recycled material content
 - b) Coordination of trades to maintain sustainable design criteria, landfill and recycling center records.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - a) Progress of Construction Waste Management
 - b) Progress of Indoor Air Quality Management
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Field Clarification. (FC)
 - 16) Status of proposal requests.
 - 17) Pending changes. (Potential Change Order – PCO)
 - 18) Status of Change Orders. (CO)
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
- 3. Minutes: Architect will record and Contractor will distribute meeting minutes.
- 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract apply to this Section.

1.2 SUBMITTALS (for information only; no action will be taken by the Architect)

- A. Submittal Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for each submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's final release or approval.
- B. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
 - 1. Submit an electronic copy of schedule.
- C. Daily Construction Reports: Submit two copies at monthly intervals.
- D. Field Condition Reports: Submit two copies at time of discovery of differing conditions.
- E. Special Reports: Submit two copies at time of unusual event.

1.3 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Submittals Schedule, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTAL SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by Contractor's Construction Schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with Contractor's Construction Schedule.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- a. At Contractor's option, show submittals on the Construction Schedule, instead of tabulating them separately.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. Procedures: Prepare precedence diagram network using AON (activity-on-node) format. Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for Commencement of the Work to date of Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Preliminary Network Diagram: Submit diagram within 14 days of date established for Commencement of the Work. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work based on indicated activities.
- D. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram for Owner review no later than 30 days after date established for Commencement of the Work.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all Work within applicable completion dates.
 - 2. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.
- E. Activities: Treat each story or separate area as a separate activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include reasonable review periods and adequate time for resubmittals in the schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - a. Identify the minimum 30-day time period allowed for color selection activity conducted by Owner and Architect to result in project color schedule.
 - 4. Startup and Testing Time: As a predecessor to Substantial Completion include activities of reasonable duration for startup and testing of equipment. Schedule should include activities for individual / specific areas, not just one activity for entire project.
 - 5. Project Acceptance: Indicate completion of work activities in advance of the date established for Project Acceptance, and include separate activities for Architect's administrative procedures necessary for certification of Final Acceptance.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- F. CPM Schedule Preparation and Constraints: Prepare a list of all activities required to complete the Work. Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work by Others: Include a separate activity for each portion of the Work performed by Owner or other contractors necessary for the completion of the Work.
 3. Owner-Furnished Products: Include a separate activity for each product. Coordinate delivery dates established by Owner with the project schedule.
 4. Owner-Furnished Permanent Utilities: Include separate activities indicating when permanent utilities are required.
 5. Activities and Work Restrictions: Indicate estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames and show the effect of the following items on the schedule as applicable:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Utility interruptions.
 - d. Uninterruptible services.
 - e. Beneficial Occupancy if applicable.
 - f. Use of premises restrictions.
 - g. Provisions for future construction.
 - h. Seasonal variations.
 - i. Environmental control.
 - j. Preparation and processing of submittals.
 - k. Mobilization and demobilization.
 - l. Work by Owner that may affect or be affected by Contractor's activities.
 6. Work Stages: Indicate estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Fabrication.
 - b. Installation.
 - c. Tests and inspections, including commissioning.
 - d. Adjusting.
 - e. Startup and placement into final use and operation.
 7. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 8. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
- G. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed (Commencement of the Work), Substantial Completion, and Final Completion.
1. Contractor shall assign cost to construction activities on the CPM schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

Architect's approval, be assigned to fabrication and delivery activities. Costs shall be assigned to closeout activities including testing and commissioning activities, delivery of operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training, if applicable.

2. Each activity cost shall reflect an accurate value subject to approval by Architect.
 3. Total cost assigned to activities shall equal the total Contract Sum.
- H. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "late finish-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Description of activity.
 2. Early and late start dates.
 3. Early and late finish dates.
 4. Activity duration in workdays.
 5. Total float or slack time.
- I. Submittal of the Final Construction Schedule by the Contractor certifies that the work will be prosecuted in accordance with the Schedule, subject to any change therein which is implemented in accordance with the Contract Documents
- J. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of all activities and relationships that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- K. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.
- L. Computer Software: Prepare schedules using SureTrak Project Manager or alternate software acceptable to Owner and Architect.
- 2.3 RECOVERY SCHEDULE
- A. Should the updated Construction Schedule show at any time during Contractor's performance, in the sole opinion of the Owner, that the Contractor is fourteen (14) or more days behind schedule for any Specific Date, or should Contractor be required to undertake actions under the General Conditions hereof, the Contractor shall prepare a Recovery Schedule at no additional cost to the Owner (unless the sole responsibility for the event or occurrence which has caused the schedule slippage is through no fault of the Contractor) explaining and displaying how Contractor intends to reschedule the Work in order to regain compliance with the Construction Schedule during the immediate subsequent pay period.
- B. Recovery Schedule Requirements:
1. The Contractor shall prepare and submit to the Owner a one-month maximum duration Recovery Schedule, which demonstrates how the progress of the Work will return to the

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

approved Construction Schedule at the earliest possible time. Prepare the Recovery Schedule to same level of detail as the Construction Schedule. This Recovery Schedule shall be prepared in coordination with other separate contractors on the Project.

2. Contractor shall advise the Owner of the effectiveness of the Recovery Schedule during the schedule recovery time period. At the conclusion of the one month schedule recovery period, the Owner will direct the Contractor as follows:
 - a. If Owner determines the Contractor is still behind schedule, Owner will direct the Contractor to prepare a Schedule Revision and comply with all of the requirements of a Schedule Revision as stated herein and the other requirements of the Contract Documents; provided, however, that nothing herein shall limit in any way the rights and remedies of the Owner as provided elsewhere in the Contract Documents.
 - b. If the Owner determines the Contractor has successfully complied with provisions of the Recovery Schedule, the Owner will direct the Contractor to return to the use of the approved Construction Schedule.

2.4 SCHEDULE REVISIONS

- A. Should Contractor desire to or be required under the Contract Documents to make modifications or changes in his method of operation, his sequence of Work or the durations of activities in the Construction Schedule, the Contractor shall do so in accordance with requirements of Contract Documents. Revisions to the approved Construction Schedule shall be identified by Contractor in writing and approved in writing by Owner prior to incorporation into the approved schedule.
- B. Logic modifications associated with change orders shall affect only those activities and performance dates directly concerned. Adjustments in scheduled intermediate Completion Dates or for the Contract as a whole will be considered only to the extent that there is insufficient remaining float to absorb these changes.
- C. Revisions to Contractor's Construction Schedule required under terms of this Section shall not modify the Contract Time or any Milestone Date and shall not modify or limit the Contractor's obligations under this Contract.
- D. If there are separate contractors on the Project, prior to the submission by the Contractor of proposed schedule revision, the Contractor shall meet with and gain written approval of the separate contractors to make the revisions which shall be evidenced by the signatures of said separate contractors on the proposed schedule revisions. If accepted by the Owner the revisions shall be binding upon Contractor and all separate contractors on the Project.
 1. Separate contractors include hazardous material remediation contractor. Schedule shall address testing and monitoring associated with remediation.
- E. Submittal of any proposed schedule revisions by the Contractor certifies that he will prosecute the Work in accordance with the schedule revision, subject to any change therein which is implemented in accordance with the Contract Documents.

2.5 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording, at a minimum, the following information concerning events at Project site:
 1. List of subcontractors at Project site.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions.
7. Meetings and significant decisions.
8. Unusual events (refer to special reports).
9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recordings.
11. Orders and requests of authorities having jurisdiction.
12. Change Orders received and implemented.
13. Construction Change Directives received and implemented.
14. Services connected and disconnected.
15. Equipment or system tests and startups.
16. Partial Completions and occupancies.
17. Substantial Completions authorized.

- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report with a request for interpretation on CSI Form 13.2A or alternate form acceptable to Architect. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week in advance of the regularly scheduled monthly meeting designated for the review of the project schedule by the Architect.
1. Revise schedule after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Start Dates, Actual Finish Dates and an accurate Completion Percentage for each activity.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Distribution: Distribute copies of approved schedule to Architect, Owner, and additional parties determined by the Contractor.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. 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. Section includes requirements for submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, LEED data, and other submittals.
- B. Related Sections:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 3. Division 1 Section "Closeout Procedures" for submitting warranties, record documents, operation and maintenance manuals, and video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Electronic (CADD) Files: The Contractor may request electronic (CADD) files utilizing the Architect's Request Form.
- B. Completeness: Submittals shall be complete in every respect and bound in sets. Each Submittal shall be clearly marked to show each item, component and optional feature proposed to be incorporated into the Project.
 1. Incomplete submittals may be returned without action. Incomplete submittal packages returned without action or for additional information are not subject to delay claims.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 5. Color Selection: In individual specification sections, specific items are identified which require color/finish selections to be made by the Architect from color chart or sample submittals. The Submittal Schedule prepared by the Architect identifies these required color/finish submittals. The Architect will make coordinated selections of colors/finishes for the building interior, present the resulting color concepts to the Owner for approval, and prepare the actual Color Schedule for the Work.
 - a. Submittals requiring color selection must be submitted by Contractor and approved by Architect for conformance with Contract Documents prior to the start of the color selection process. When the submittals have been approved for conformance

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- with Contract Documents, the process for color selection, presentation of color concepts, Owner approval, and Color Schedule preparation will begin.
- b. After approval of all interior color related submittals for conformance with Contract Documents, the Contractor shall allow a minimum of thirty (30) days for the color selection, Owner's approval process, and preparation of the Color Schedule.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, in accordance with General Conditions and as follows. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 20 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 20 days for review of each resubmittal.
4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing or to allow for a resubmittal, if necessary.
- E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package of all required submittals in the individual Section into a single indexed file with links enabling navigation to each item.
2. Name file with Specification section, including revision identifier.
- a. Name each item (product data, shop drawings etc.) within the package with a unique numeric suffix identifier
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Include the following information on an inserted cover sheet:
- a. Project name.
- b. Date.
- c. Name and address of Architect.
- d. Name of Contractor.
- e. Name of firm or entity that prepared submittal.
- f. Name of subcontractor.
- g. Name of supplier.
- h. Name of manufacturer.
- i. Number and title of appropriate Specification Section.
- j. Drawing number and detail references, as appropriate.
- k. Location(s) where product is to be installed, as appropriate.
- l. Related physical samples submitted directly.
- m. Other necessary identification.
5. Include the following information as keywords in the electronic file metadata:
- a. Project name.
- b. Number and title of appropriate Specification Section.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- c. Manufacturer name.
 - d. Product name.
- F. Options: Identify options requiring selection by the Architect.
- G. Deviations: Identify deviations from the Contract Documents on submittals.
- H. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
 - 1. Transmittal Form: Use AIA Document G810, or other approved form.
 - 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
 - 4. Identify resubmittals with same identifier as original submittal and a revision suffix number.
- J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- K. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Electronic submittals are acceptable on this project. Prior to construction, the Contractor and Architect shall discuss the method for exchanging files. Use of the Architect's Newforma InfoExchange website and procedures can be used at no charge. If the Contractor chooses to use a different platform and methodology:
 - a. The Architect may reject the methodology or platform proposed and.
 - 1) use the Architect's Newforma InfoExchange website, or
 - 2) the project team will revert to traditional hard-copy exchange
 - b. or the Contractor shall bear the cost of software, licensing, training etc for the project team to participate.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
 3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
 4. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's printed and published installation instructions.
 - d. Standard color charts.
 - e. Statement of compliance with specified referenced standards.
 - f. Testing by recognized testing agency.
 - g. Application of testing agency labels and seals.
 - h. Notation of coordination requirements.
 - i. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data as PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 42 inches (750 by 1067 mm).
 - 3. Submit Shop Drawings as PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 - 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit two sets of Samples. Architect will retain both sets;
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least two sets of paired units that show approximate limits of variations.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- E. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- F. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- G. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- H. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
 - 4. Submit subcontract list as PDF electronic file.
- I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.
- K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- P. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- Q. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- R. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements." Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- S. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- T. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- U. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally-signed PDF electronic file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections required, and return it. The Architect will attach a comment sheet that will indicate what "action" the Contractor shall take. "Actions" and review procedure will be clarified at the Preconstruction Conference.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval as noted from Architect.
- E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections:
 - 1. Section 013200 "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.
- J. Experienced: When used with an entity or individual, “experienced” means having successfully completed work similar in nature, size, and extent to this Project; being familiar with special requirements indicated; having complied with requirements of authorities having jurisdiction; and whose work has resulted in construction with a record of successful in-service performance.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Contractor's Quality-Control Manager Qualifications: For supervisory personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Seismic-force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by the Architect.
 2. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.
- D. Testing Agency Qualifications: For testing agencies specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
 2. Entity responsible for performing tests and inspections.
 3. Description of test and inspection.
 4. Identification of applicable standards.
 5. Identification of test and inspection methods.
 6. Number of tests and inspections required.
 7. Time schedule or time span for tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, including the following:
1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 2. Special inspections required by authorities having jurisdiction and indicated on the “Statement of Special Inspections.”
 3. Owner-performed tests and inspections indicated in the Contract Documents, **including tests and inspections indicated to be performed by the Commissioning Authority.**
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
 - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 7. Demolish and remove mockups when directed, unless otherwise indicated.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.9 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Notify testing agencies at least **24** hours in advance of time when Work that requires testing or inspecting will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
- 1.10 SPECIAL INSPECTIONS AND TESTS
- A. Special Inspections and Tests: Owner will engage a qualified special inspector to conduct special inspections and tests required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 014200 – REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the **General** Conditions of the Contract. **The definitions of this section are in addition to, not in place of, those found in the General Conditions.**
- B. “Approved”: When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. “Directed”: A command or instruction by Architect. Other terms including “requested,” “authorized,” “selected,” “required,” and “permitted” have the same meaning as “directed.”
- D. “Indicated”: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including “shown,” “noted,” “scheduled,” and “specified” have the same meaning as “indicated.”
- E. “Regulations”: Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. “Furnish”: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. “Install”: Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. “Installer”: An installer is Contractor or another entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as “carpentry” does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter.” It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- I. “Provide”: Furnish and install, complete and ready for the intended use.
- J. “Project Site”: Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- K. The term “experienced,” when used with the term “installer,” means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- L. “Replace”: The term “replace” means to provide an acceptable like product or material in the place of a missing or unacceptable (rejected) product or material. To “replace” an unacceptable

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

product or material includes its removal and disposal. (The term “reinstall” shall be used to indicate reuse of the original.)

- M. “Punch List” (AIA A201): A “punch list” is a listing of work items required by the Contract Documents which are incomplete or non-conforming. The list of observed deficiencies is compiled in the course of review to determine if the Contractor has attained Substantial Completion. It does not constitute a definitive list of remaining work items, and does not limit, amend or supersede requirements of the Contract Documents. Completion of punchlist items is a requirement to achieve Substantial Completion, **in accordance with the General Conditions**.
- N. “Written” or “Printed” when used in conjunction with manufacturer’s product handling and installation requirements means to comply with the manufacturer’s current printed and published information.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
- E. Abbreviations and Names: Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities. Refer to Gale Research's “Encyclopedia of Associations” or Columbia Books' “National Trade & Professional Associations of the U.S.,” which are available in most libraries.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 014520 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Balancing Air Systems:
 - a. Variable-air-volume systems.
- 2. Balancing Hydronic Piping Systems:
 - a. Variable-flow hydronic systems.
- 3. Testing, Adjusting, and Balancing Equipment:
 - a. Heat exchangers.
 - b. Motors.
 - c. Chillers.
 - d. Cooling towers.
 - e. Condensing units.
 - f. Boilers.
 - g. Heat-transfer coils.
- 4. Testing, adjusting, and balancing existing systems and equipment.
- 5. Additional Tests.
 - a. Seasonal tests.
 - b. Duct Leakage Testing.
 - c. Controls verification.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation system.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

1.4 PREINSTALLATION MEETINGS

- A. TAB Conference: If requested by the Owner or Architect, conduct a TAB conference at Project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' notice of scheduled meeting time and location.

- 1. Minimum Agenda Items:

- a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Needs for coordination and cooperation of trades and subcontractors.
 - d. Proposed procedures for documentation and communication flow.

1.5 ACTION SUBMITTALS

- 1. TAB Report: Documentation indicating that Work complies with ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB agent and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 60 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within 90 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- D. System Readiness Checklists: Within 90 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.
- E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.
- F. Certified TAB reports: Within 14 days of completion of balancing work, submit testing and balancing report.
- G. Sample report forms.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

1.7 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC or NEBB. TAB provider shall be an independent company from the contractors performing the work.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC or NEBB.
 - 2. TAB Technician: Employee of the TAB specialist and certified by AABC or NEBB as a TAB technician.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."
- D. The following information shall be submitted as part of the Quality Assurance Submittal:
 - 1. Provide evidence of satisfactory completion of at least two projects of similar size and scope. Submit the following for each project:
 - a. Completed testing and balancing reports for each project.
 - b. If not included in the testing and balancing report, provide equipment startup checklists for each project.
 - c. Owner contact for each project.
 - d. Design engineer contact for each project.
 - e. Architect contact for each project.
 - 2. The Architect shall determine whether the agent is qualified and the decision shall be final. Re-submittals on behalf of the same company shall not be considered.
- E. TAB Conference: After approval of the TAB submittals, the TAB specialist shall arrange a meeting with the Owner's and the Architect's representatives to develop a mutual understanding of the details and review the TAB strategies and procedures plan. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installer, and other support personnel. Provide 14 days' notice of scheduled meeting time and location.
 - 1. Minimum Agenda:
 - a. Submittal distribution requirements.
 - b. Contract documents examination report.
 - c. TAB strategies and procedures plan.
 - d. Work schedule and project site access requirements.
 - e. Coordination and cooperation of trades and subcontractors.
 - f. Coordination of documentation and communication flow.
 - g. Systems readiness checklists.
- F. TAB Reports: Use standard forms from AABC's "National Standards for TAB" or NEBB's "Procedural Standards for TAB of Environmental Systems."

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- G. Instrumentation Type, Quantity, and Accuracy: As described in the "AABC National Standards for Total System Balance" or NEBB's "Procedural Standards for TAB of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."
- H. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.8 FIELD CONDITIONS

- A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.9 COORDINATION

- A. Coordinate the efforts of work performed under other sections for operation of systems and equipment to support and assist TAB activities.
- B. Notice: Provide 7 days' notice to the Contractor and Architect for each test. Include scheduled test dates and times.
- C. Perform TAB after any required leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.10 WARRANTY

- A. General Warranty: The national project performance guarantee indicated in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Guarantee: Provide a guarantee on NEBB or AABC forms stating that NEBB or AABC will assist in completing the requirements of the Contract Documents if the TAB Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:
 - 1. The certified Agent has tested and balanced systems according to the Contract Documents.
 - 2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Volume, smoke, and fire dampers are open and functional.
 - d. Clean filters are installed.
 - e. Fans are operating, free of vibration, and rotating in correct direction.
 - f. Variable-frequency controllers' startup is complete and safeties are verified.
 - g. Automatic temperature-control systems are operational.
 - h. Ceilings are installed.
 - i. Windows and doors are installed.
 - j. Suitable access to balancing devices and equipment is provided.
 - 2. Hydronics:
 - a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
 - b. Piping is complete with terminals installed.
 - c. Water treatment is complete.
 - d. Systems are flushed, filled, and air purged.
 - e. Strainers are pulled and cleaned.
 - f. Control valves are functioning per the sequence of operation.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- g. Shutoff and balance valves have been verified to be 100 percent open.
- h. Pumps are started and proper rotation is verified.
- i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
- j. Variable-frequency controllers' startup is complete and safeties are verified.
- k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance," ASHRAE 111, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230700 "HVAC Insulation,".
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

- A. Adjust the variable-air-volume systems as follows:
 - 1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge.
 - 2. Verify that the system is under static pressure control.
 - 3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
 - 4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:
 - a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
 - b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
 - c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
 - d. Adjust controls so that terminal is calling for minimum airflow.
 - e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
 - f. When in full cooling or full heating, ensure that there is no mixing of hot-deck and cold-deck airstreams unless so designed.
 - g. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.
 - 5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
 - c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
6. Measure fan static pressures as follows:
- a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report any artificial loading of filters at the time static pressures are measured.
7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
- a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
 - b. Verify that terminal units are meeting design airflow under system maximum flow.
8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.
9. Verify final system conditions as follows:
- a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
 - b. Re-measure and confirm that total airflow is within design.
 - c. Re-measure final fan operating data, rpms, volts, amps, and static profile.
 - d. Mark final settings.
 - e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
 - f. Verify tracking between supply and return fans.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.

- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
1. Check liquid level in expansion tank.
 2. Check highest vent for adequate pressure.
 3. Check flow-control valves for proper position.
 4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
 5. Verify that motor starters are equipped with properly sized thermal protection.
 6. Check that air has been purged from the system.

3.7 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

- A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.
- B. Adjust the variable-flow hydronic system as follows:
1. Verify that the differential-pressure sensor is located as indicated.
 2. Determine whether there is diversity in the system.
- C. For systems with no diversity:
1. Adjust pumps to deliver total design gpm.
 - a. Measure total water flow.
 - 1) Position valves for full flow through coils.
 - 2) Measure flow by main flow meter, if installed.
 - 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 - b. Measure pump TDH as follows:
 - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gage heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 - c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

2. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
 3. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
 4. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
 5. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
 6. Prior to verifying final system conditions, determine the system differential-pressure set point.
 7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
 8. Mark final settings and verify that all memory stops have been set.
 9. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - c. Mark final settings.
 10. Verify that memory stops have been set.
- D. For systems with diversity:
1. Determine diversity factor.
 2. Simulate system diversity by closing required number of control valves, as approved by the design engineer.
 3. Adjust pumps to deliver total design gpm.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- a. Measure total water flow.
 - 1) Position valves for full flow through coils.
 - 2) Measure flow by main flow meter, if installed.
 - 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 - b. Measure pump TDH as follows:
 - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gage heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 - c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
4. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
 5. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
 6. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure, and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
 7. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
- 8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.
- 9. Prior to verifying final system conditions, determine system differential-pressure set point.
- 10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
- 11. Mark final settings and verify that memory stops have been set.
- 12. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - c. Mark final settings.
- 13. Verify that memory stops have been set.

3.8 PROCEDURES FOR HEAT EXCHANGERS

- A. Adjust water flow to within specified tolerances.
- B. Measure inlet and outlet water temperatures.
- C. Measure inlet steam pressure.
- D. Check settings and operation of safety and relief valves. Record settings.

3.9 PROCEDURES FOR MOTORS

- A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 - 1. Manufacturer's name, model number, and serial number.
 - 2. Motor horsepower rating.
 - 3. Motor rpm.
 - 4. Phase and hertz.
 - 5. Nameplate and measured voltage, each phase.
 - 6. Nameplate and measured amperage, each phase.
 - 7. Starter size and thermal-protection-element rating.
 - 8. Service factor and frame size.
- B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.10 PROCEDURES FOR CHILLERS

- A. Balance water flow through each evaporator and condenser to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:
1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
 2. For water-cooled chillers, condenser-water entering and leaving temperatures, pressure drop, and water flow.
 3. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
 4. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
 5. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
 6. Capacity: Calculate in tons of cooling.
 7. For air-cooled chillers, verify condenser-fan rotation and record fan and motor data including number of fans and entering- and leaving-air temperatures.

3.11 PROCEDURES FOR COOLING TOWERS

- A. Balance total condenser-water flows to towers. Measure and record the following data:
1. Condenser-water flow to each cell of the cooling tower.
 2. Entering- and leaving-water temperatures.
 3. Wet- and dry-bulb temperatures of entering air.
 4. Wet- and dry-bulb temperatures of leaving air.
 5. Condenser-water flow rate recirculating through the cooling tower.
 6. Cooling-tower spray pump discharge pressure.
 7. Condenser-water flow through bypass.
 8. Fan and motor operating data.

3.12 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record fan and motor operating data.

3.13 PROCEDURES FOR BOILERS

- A. Hydronic Boilers:
1. Measure and record entering- and leaving-water temperatures.
 2. Measure and record water flow.

3. Record relief valve pressure setting.

B. Steam Boilers:

1. Measure and record entering-water temperature.
2. Measure and record feed water flow.
3. Measure and record leaving-steam pressure and temperature.
4. Record relief valve pressure setting.

3.14 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop for major (more than 20 gpm) equipment coils, excluding unitary equipment such as reheat coils, unit heaters, and fan-coil units.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.

3.15 DUCT LEAKAGE TESTS

- A. Witness the duct pressure testing performed by Installer.
- B. Verify that proper test methods are used and that leakage rates are within specified tolerances.

- C. Report deficiencies observed.

3.16 CONTROLS VERIFICATION

- A. In conjunction with system balancing, perform the following:
 - 1. Verify temperature control system is operating within the design limitations.
 - 2. Confirm that the sequences of operation comply with Contract Documents.
 - 3. Verify that controllers are calibrated and function as intended.
 - 4. Verify that controller set points are as indicated.
 - 5. Verify the operation of lockout or interlock systems.
 - 6. Verify the operation of valve and damper actuators.
 - 7. Verify that controlled devices are properly installed and connected to correct controller.
 - 8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
 - 9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.
- B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.17 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: 0 to plus 10 percent.
 - 2. Air Outlets: Plus or minus 10 percent.
 - 3. Return Inlets: Plus or minus 10 percent.
 - 4. Exhaust Inlets: 0 to plus 10 percent.
 - 5. Heating-Water Flow Rate: Plus or minus 10 percent.
 - 6. Cooling-Water Flow Rate: Plus or minus 10 percent.
 - 7. Unless indicated otherwise: Plus or minus 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.18 PROGRESS REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- B. Status Reports: Prepare [**weekly**] [**biweekly**] [**monthly**] <Insert time interval> progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.19 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Pump curves.
 2. Fan curves.
 3. Manufacturers' test data.
 4. Field test reports prepared by system and equipment installers.
 5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
 2. Name and address of the TAB specialist.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
- 1. Quantities of outdoor, supply, return, and exhaust airflows.
 - 2. Water and steam flow rates.
 - 3. Duct, outlet, and inlet sizes.
 - 4. Pipe and valve sizes and locations.
 - 5. Terminal units.
 - 6. Balancing stations.
 - 7. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
- 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 - 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- c. Fan rpm.
- d. Discharge static pressure in inches wg.
- e. Filter static-pressure differential in inches wg.
- f. Preheat-coil static-pressure differential in inches wg.
- g. Cooling-coil static-pressure differential in inches wg.
- h. Heating-coil static-pressure differential in inches wg.
- i. Outdoor airflow in cfm.
- j. Return airflow in cfm.
- k. Outdoor-air damper position.
- l. Return-air damper position.
- m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

- a. System identification.
- b. Location.
- c. Coil type.
- d. Number of rows.
- e. Fin spacing in fins per inch.
- f. Make and model number.
- g. Face area in square feet.
- h. Tube size in NPS.
- i. Tube and fin materials.
- j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

- a. Airflow rate in cfm.
- b. Average face velocity in fpm.
- c. Air pressure drop in inches wg.
- d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
- e. Return-air, wet- and dry-bulb temperatures in deg F.
- f. Entering-air, wet- and dry-bulb temperatures in deg F.
- g. Leaving-air, wet- and dry-bulb temperatures in deg F.
- h. Water flow rate in gpm.
- i. Water pressure differential in feet of head or psig.
- j. Entering-water temperature in deg F.
- k. Leaving-water temperature in deg F.
- l. Refrigerant expansion valve and refrigerant types.
- m. Refrigerant suction pressure in psig.
- n. Refrigerant suction temperature in deg F.
- o. Inlet steam pressure in psig.

G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Fuel type in input data.
 - g. Output capacity in Btu/h.
 - h. Ignition type.
 - i. Burner-control types.
 - j. Motor horsepower and rpm.
 - k. Motor volts, phase, and hertz.
 - l. Motor full-load amperage and service factor.
 - m. Sheave make, size in inches, and bore.
 - n. Center-to-center dimensions of sheave and amount of adjustments in inches.
2. Test Data (Indicated and Actual Values):
- a. Total airflow rate in cfm.
 - b. Entering-air temperature in deg F.
 - c. Leaving-air temperature in deg F.
 - d. Air temperature differential in deg F.
 - e. Entering-air static pressure in inches wg.
 - f. Leaving-air static pressure in inches wg.
 - g. Air static-pressure differential in inches wg.
 - h. Low-fire fuel input in Btu/h.
 - i. High-fire fuel input in Btu/h.
 - j. Manifold pressure in psig.
 - k. High-temperature-limit setting in deg F.
 - l. Operating set point in Btu/h.
 - m. Motor voltage at each connection.
 - n. Motor amperage for each phase.
 - o. Heating value of fuel in Btu/h.
- H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
1. Unit Data:
- a. System identification.
 - b. Location.
 - c. Coil identification.
 - d. Capacity in Btu/h.
 - e. Number of stages.
 - f. Connected volts, phase, and hertz.
 - g. Rated amperage.
 - h. Airflow rate in cfm.
 - i. Face area in square feet.
 - j. Minimum face velocity in fpm.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

2. Test Data (Indicated and Actual Values):
 - a. Heat output in Btu/h.
 - b. Airflow rate in cfm.
 - c. Air velocity in fpm.
 - d. Entering-air temperature in deg F.
 - e. Leaving-air temperature in deg F.
 - f. Voltage at each connection.
 - g. Amperage for each phase.
- I. Fan Test Reports: For supply, return, and exhaust fans, include the following:
 1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- d. Duct static pressure in inches wg.
- e. Duct size in inches.
- f. Duct area in square feet.
- g. Indicated airflow rate in cfm.
- h. Indicated velocity in fpm.
- i. Actual airflow rate in cfm.
- j. Actual average velocity in fpm.
- k. Barometric pressure in psig.

K. Air-Terminal-Device Reports:

1. Unit Data:

- a. System and air-handling unit identification.
- b. Location and zone.
- c. Apparatus used for test.
- d. Area served.
- e. Make.
- f. Number from system diagram.
- g. Type and model number.
- h. Size.
- i. Effective area in square feet.

2. Test Data (Indicated and Actual Values):

- a. Airflow rate in cfm.
- b. Air velocity in fpm.
- c. Preliminary airflow rate as needed in cfm.
- d. Preliminary velocity as needed in fpm.
- e. Final airflow rate in cfm.
- f. Final velocity in fpm.
- g. Space temperature in deg F.

L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

- a. System and air-handling-unit identification.
- b. Location and zone.
- c. Room or riser served.
- d. Coil make and size.
- e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

- a. Airflow rate in cfm.
- b. Entering-water temperature in deg F.
- c. Leaving-water temperature in deg F.
- d. Water pressure drop in feet of head or psig.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

- e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.
- M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
- 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in gpm.
 - g. Water pressure differential in feet of head or psig.
 - h. Required net positive suction head in feet of head or psig.
 - i. Pump rpm.
 - j. Impeller diameter in inches.
 - k. Motor make and frame size.
 - l. Motor horsepower and rpm.
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. Full-load amperage and service factor.
 - p. Seal type.
 - 2. Test Data (Indicated and Actual Values):
 - a. Static head in feet of head or psig.
 - b. Pump shutoff pressure in feet of head or psig.
 - c. Actual impeller size in inches.
 - d. Full-open flow rate in gpm.
 - e. Full-open pressure in feet of head or psig.
 - f. Final discharge pressure in feet of head or psig.
 - g. Final suction pressure in feet of head or psig.
 - h. Final total pressure in feet of head or psig.
 - i. Final water flow rate in gpm.
 - j. Voltage at each connection.
 - k. Amperage for each phase.
- N. Instrument Calibration Reports:
- 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

DOBO HALL RENOVATION,
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No: 580999

3.20 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Owner.
- B. Owner shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
 - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 - 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
 - 3. If the second verification also fails, Owner may contact AABC Headquarters regarding the AABC National Performance Guaranty.
- F. Prepare test and inspection reports.

3.21 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.
- C. When requested, provide up to two 32 hours by the technician that provided services under this Section to support commissioning.

END OF SECTION 014520

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Owner will pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Owner will pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.
- E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- B. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 3. Indicate sequencing of work that requires water, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Dust-, Silica- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-, silica-, and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust- and silica-control partitions at each phase of work.
 2. HVAC system isolation schematic drawing.
 3. Location of proposed air-filtration system discharge.
 4. Waste handling procedures.
 5. Other dust- and silica-control measures.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines
- D. Comply with OSHA requirements as they relate to the type of Work required, including but not limited to, silica-control measures.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Polyethylene Sheet: Reinforced, fire-resistive sheet, **10-mil (0.25-mm)** minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- B. Dust- and Silica-Control Adhesive-Surface Walk-off Mats: Provide mats minimum **36 by 60 inches (914 by 1624 mm)**.
- C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Conference area of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and ~~4-foot-~~ (1.2-m-) square tack and marker boards.
 3. Lighting fixtures sufficient to maintain average illumination of ~~20 fc~~ (215 lx) at desk height.
 4. Maintain the following materials, specified elsewhere, in the field office available to Architect and Owner's representative at all times:
 - a. Maintain up-to-date set of Contract Documents, including FCs, RFIs, PCOs and COs.
 - b. Maintain up-to-date set of reviewed final shop drawings.
 - c. Maintain up-to-date Contractor's Progress Schedule.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 3. The contractor shall have the responsibility to operate the heaters in a manner that provides a safe working environment as well as maintaining the required temperatures for performance of the work.
 4. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Toilets: Use of Owner's existing toilet facilities will not be permitted.
 - 2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel.
 - 3. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
 - 4. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.
 - a. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
 - 5. Drinking-Water: Bottled-water, drinking-water units, or drinking water fountains connected to permanent or temporary potable water source.
- D. Isolation of Work Areas from finished areas: Prevent dust, silica, fumes, and odors from entering finished areas.
 - 1. Prior to commencing work, isolate the HVAC system in areas where work is to be performed.
 - a. Disconnect supply and return ductwork in work areas from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust and silica partitions during the Work. Use vacuum collection attachments on dust-producing equipment and methods and procedures to collect silica-producing material debris and dust. Isolate work within occupied areas using dust- and silica-containment devices or methods.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 2. If permanent lighting is not available at time of installation of interior finishes, provide temporary lighting that simulates permanent lighting conditions during installation of interior finishes.
- H. Telephone/Cable Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
 1. Provide additional telephone lines for the following:
 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- I. Electronic Communication Service: Provide high speed Internet service for use by all construction forces.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental, OSHA, and other regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
 1. .

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- F. Egress: Maintain egress from existing occupied facilities as required by authorities having jurisdiction and as indicated.
- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- H. Temporary Partitions: Provide floor-to-ceiling dustproof and silica-proof partitions or methods to limit dust, silica, and dirt migration and to separate areas occupied by Owner from fumes and noise.
 - 1. Construct partitions with two layers of 6-mil (0.14-mm) polyethylene sheet on each side. Cover floor with two layers of 6-mil (0.14-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - 2. silica-proof doors and security locks where openings are required.
 - 3. Protect air-handling equipment.
 - 4. Provide walk-off mats at each entrance through partitions.
 - 5. Provide doors in partitions where needed for egress, to the satisfaction of the Building Official.
- I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.4 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, partitions, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve required results and to avoid possibility of damage and violations with federal, state, local regulations.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 016000 - PRODUCT REQUIREMENTS

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. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Sections:
 - 1. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request.
 - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 1. Store products to allow for inspection and measurement of quantity or counting of units.
 2. Store materials in a manner that will not endanger Project structure.
 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 6. Protect stored products from damage and liquids from freezing.
 7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces, if any. Coordinate location with Owner.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - 3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
 - 1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when all of the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 017300 – EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction 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 construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 - 2. 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. Operational elements include, but are not limited to, the following:
 - a. Primary operational systems and equipment.
 - b. Air or smoke barriers.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- c. Mechanical systems piping and ducts.
 - d. Control systems.
 - e. Communication systems.
 - f. Electrical wiring systems.
 - g. Operating systems of special construction.
- 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include, but are not limited to, the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Equipment supports.
 - e. Piping, ductwork, vessels, and equipment.
 - f. Noise- and vibration-control elements and systems.
- 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction 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.
 - a. Restrict cutting and patching of existing brick masonry indicated to remain to areas and methods approved by Architect.
- B. Manufacturer's Installation Instructions: Comply with manufacturer's current printed and published (written) instructions and recommendations for storing and installing products and equipment in applications indicated. Maintain copies on-site.

1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. 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.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."
- E. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages in the construction.
- F. Coordinate delivery of items to Project site.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- C. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

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.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of **96 inches (2440 mm)** in occupied spaces and **90 inches (2300 mm)** in unoccupied spaces.
- 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. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 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.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

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. Temporary Support: Provide temporary support of work to be cut.
- C. 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.
- D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Section 011000 "Summary."
- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- F. 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 neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 5. Proceed with patching after construction operations requiring cutting are complete.
- G. 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 practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical 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 minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 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.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
- 4. New Masonry Openings: Tooth in new matching masonry to build opening size required. Incorporate new lintel where required.
- 5. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
- H. Existing Concrete Floor Surface: Provide trowelable leveling and patching compounds. Compounds shall be latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated. Coordinate with Division 09 flooring specifications. Prepare concrete substrate in accordance with manufacturer's printed and published instructions, including shot-blasting the substrate, to ensure proper adhesion of the leveling and patching compounds.
- I. Existing Sprayed-on Fireproofing: Where existing sprayed-on fireproofing is cut and removed or otherwise damaged to install new construction; patch damaged and removed areas with fireproofing materials matching existing to maintain rating.
- J. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three 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.
 - a. Utilize containers intended for holding waste materials of type to be stored.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- 4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.
 - 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: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."
 - 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.
- 3.8 STARTING AND ADJUSTING
- A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."
 - B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
 - C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
 - D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3.9 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.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 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.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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 administrative and procedural requirements for the following:
 - 1. Recycling non-hazardous [demolition and] construction waste.
 - 2. Disposing of non-hazardous [demolition and] construction waste.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

1.4 SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include the following information:
 - 1. Spreadsheet tabulating total waste material, quantities diverted and means by which each material is diverted, and statement that requirements have been met.
 - 2. All records substantiating the information reported on the spreadsheet, including manifests, weight tickets, receipts, and invoices. Records must be legible and must indicate the date issued, the waste material donated, the weight (in tons) or volume (in cubic yards) of material, and the name, address, and phone number of the receiving entity. The following records must be submitted:
 - a. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
 - b. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- c. Recycling and Processing Facility Records: Indicate receipt and acceptance of recycled waste by recycling and processing facilities licensed to accept them. Include manifests, weight, tickets, receipts, and invoices.
- d. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
 - 1. The Waste Management Plan shall contain the following information, as a minimum:
 - a. A spreadsheet, which lists:
 - 1) Each waste stream leaving the site (example: steel, concrete, cardboard, trash)
 - 2) The name and address of the receiving entity
 - 3) Contact name and phone number at the receiving entity
 - b. A narrative, which describes:
 - 1) Who is the primary person responsible for implementing the CWM plan
 - 2) What wastes must be separated for recycling
 - 3) How hazardous wastes are to be handled
 - 4) How the construction waste management plan, including updates, will be communicated to all involved parties (example: CWM will be on the agenda of all construction progress meetings)
 - 5) How the construction waste management plan will be enforced

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- 6) How data will be tracked and filed (important: receipts must be legible and must include the name of the hauler, the date hauled, the material hauled, the weight or volume of material hauled)

PART 2 - PRODUCTS

2.1 RESOURCES

- A. The Architect will provide a list of potential resources upon request at the Preconstruction Conference, for information purposes. The Architect does not recommend or approve any of the listed entities. See also U.S. General Services Administration (GSA) online Construction Waste Management Database <http://www.wbdg.org/tools/cwm.php>.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 1. Comply with Division 1 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Designate a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Procedures:
 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.3 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
 - 2. Section 017300 "Execution" for progress cleaning of Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 ABOVE-CEILING WORK:

- A. Complete above-ceiling work prior to installation of finish ceilings. Coordinate with the Owner's third-party contractors, such as data network and security systems, if any.
- B. Complete or correct deficiencies, if any, noted by Architect, Owner and local authorities having jurisdiction or confirm with Architect that any such deficiencies may be completed or corrected at a later date without obstructing installation of ceilings.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Coordinate with local authorities having jurisdiction to obtain required above-ceiling reviews. Complete or correct above-ceiling work to comply with directives issued by the reviewing authorities. Upon completion or correction, certify in writing that all the items cited by reviewing authority have been completed or corrected and submit copies to the local authority, Owner, and Architect.
- D. Following completion of Items A, B and C above, the ceiling may be “enclosed.” Coordinate installation of acoustical ceiling hold-down clips, if any, with late stage activities such as HVAC testing and balancing and data network testing.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of **10** days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain signature of Owner's agent for receipt of submittals.
 - 5. Submit test/adjust/balance records.
 - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of **10** days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment. Demonstrate that air systems are balanced and that automatic temperature control system is in control of all equipment as

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- indicated. This may require separate demonstrations if controls cannot be tested for applicable seasons of the year.
4. Submit written certification that all special inspections have been completed.
 5. Submit written certification that all Building Commissioning has been completed, and as required by the appropriate Sections.
 6. Submit written certification that testing/adjusting/balancing operations have been completed, and that systems are operational and under control in conformance with requirements of Division 1.
 7. Complete testing of the electronic security [and related detention] equipment demonstrating security control.
 8. Perform preventive maintenance on equipment used prior to Substantial Completion.
 9. Advise Owner of changeover in heat and other utilities.
 10. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 11. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 12. Complete final cleaning requirements, including touchup painting.
 13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of **10** days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and contractor will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.8 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding interior in numbered order of Architect's finish schedule.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect
 - d. Name of Contractor.
 - e. Page number.
 - 4. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Architect will return annotated file.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grilles.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
 - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - q. Leave Project clean and ready for occupancy.
- B. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- C. Construction Waste Disposal: Comply with waste disposal requirements in 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
- 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for final property survey.
 - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned record prints
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- E. Reports: Submit written report monthly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Revisions to routing of piping and conduits.
 - d. Revisions to electrical circuitry.
 - e. Actual equipment locations.
 - f. Duct size and routing.
 - g. Locations of concealed internal utilities.
 - h. Changes made by Change Order or Construction Change Directive.
 - i. Changes made following Architect's written orders.
 - j. Details not on the original Contract Drawings.
 - k. Field records for variable and concealed conditions.
 - l. Record information on the Work that is shown only schematically.
 - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
 - 1. Format: Annotated PDF electronic file with comment function enabled.
 - 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - 3. Refer instances of uncertainty to Architect for resolution.
 - 4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013300 "Submittal Procedures" for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- D. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
 - 1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 - 2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- E. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 - 1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Format: Annotated PDF electronic file with comment function enabled.
 - 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 - 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3. Note related Change Orders and record Drawings where applicable.

- B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

- B. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

- B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with fly ash or ground granulated blast-furnace slag.

1.3 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mix water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Submission shall indicate details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
- E. Material Certificates: Signed by manufacturers certifying that, if used, each of the following items complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Admixtures.
 - 4. Curing materials.
 - 5. Floor and slab treatments.
 - 6. Bonding agents.
 - 7. Vapor retarders
 - 8. Epoxy joint filler.
 - 9. Joint-filler strips.
 - 10. Repair materials.
 - 11. Fiber reinforcement.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete Work 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.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
 - 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.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- F. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed (weldable reinforcing steel).
- C. Plain-Steel Wire: ASTM A 82, as drawn.
- D. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete 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 or CRSI Class 2 stainless-steel bar supports.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
 - 1. Fly Ash: ASTM C 618, Class F.
 - 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows: Nominal Maximum Aggregate Size: 1 inch.
- C. Water: Potable and complying with ASTM C 94.

2.4 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.5 VAPOR BARRIER

- A. Vapor Barrier: A 15 mil vapor barrier with a permeability of 0.0084 perms or lower when tested in accordance with ASTM E 96; meeting or exceeding the requirement of ASTM E 1745 Class A; and wherein the vapor barrier component (plastic) is no less than 15 mils thick in accordance with ACI 302.1 R-96. Include companion joint tape, mastic, and accessory materials.
- B. Lap and seal all joints and repair any damage in accordance with manufacturers approved printed instructions.

2.6 FLOOR AND SLAB TREATMENTS

- A. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

2.7 FLOOR AND SLAB TREATMENT (SEALER)

- A. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens and densifies concrete surfaces.

2.8 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. dry.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- 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.

2.9 RELATED MATERIALS

- A. Isolation Joint-Filler Strip: ASTM D 1751, pre-formed asphalt-saturated cellulosic fiber. Thickness as indicated.
- B. Expansion Joint Filler Strip: Pre-formed closed cell polyethylene foam with pressure sensitive adhesive. Thickness as indicated.
- C. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- D. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- E. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than .0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete debris.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, 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 or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.

2.11 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Footings and Foundation Walls: Proportion normal-weight concrete mix as follows:
 - 1. Maximum Slump: 4 inches.
 - 2. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch slump.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3. Compressive Strength (28 Days): As indicated.
- D. Slab-on-Grade: Proportion normal-weight concrete mix as follows:
 1. Maximum Slump: 4 inches.
 2. Compressive Strength (28 Days): As indicated.
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 25 percent.
 2. Ground Granulated Blast-Furnace Slag: 25 percent.
- F. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
 1. Air Content: 6 percent for 1-inch-nominal maximum aggregate size.
- G. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.
- H. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- I. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) 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 and concrete with a water-cementitious materials ratio below 0.50.

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, and furnish batch ticket information.
 1. When air temperature is between 85 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.

PART 3 - EXECUTION

3.1 EMBEDDED ITEMS

- 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.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Install anchor bolts, accurately located, to elevations required.
2. Install dovetail anchor slots in concrete structures as indicated.

3.2 VAPOR RETARDER

- A. Place, protect, and repair vapor retarder sheets according to ASTM E 1643 and manufacturer's written instructions.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing 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.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports for minimum concrete cover. Do not tack weld crossing reinforcing bars.
 1. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric 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.

3.4 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 from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- 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. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be 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 specified. Deposit concrete to avoid segregation.
- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
 - 1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches 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 mix 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, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. 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 air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 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 mix designs.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F 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. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, 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.
1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic tile and other bonded cementitious floor finishes.
- 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 restraighening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing.
- D. Trowel Finish: After applying float finish, apply first trowel finish 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 and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
 2. Finish and measure surface so gap at any point between concrete surface and an unleveled free standing 10 foot long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
- E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.7 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete 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: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.8 CONCRETE PROTECTION 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 with recommendations in ACI 305R 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 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 by one or a combination of the following methods:
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, 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 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. 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.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- 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 recommends for use with floor coverings.
- 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.
- 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.

3.9 LIQUID FLOOR TREATMENTS

- 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 seven 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.

3.10 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 six months. 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 joint clean and dry.

3.11 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 one part portland cement to two and one-half parts fine aggregate passing a No. 16 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.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. 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 will match 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 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 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 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 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix 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 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.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- 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.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- 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 one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, 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 mix.
 - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimens at 7 days, two at 28 days, and one at 56 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
- C. Strength of each concrete mix 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.
- D. 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 mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- 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. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 033000

SECTION 034900 - GLASS-FIBER-REINFORCED CONCRETE (GFRC)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes glass-fiber-reinforced concrete (GFRC) panels and moldings consisting of GFRC panel frames, anchors, and connection hardware.
- B. Related Requirements:
 - 1. Section 068200 "Glass-Fiber-Reinforced Plastic (FRP)" for molded FRP fabrications.

1.3 DEFINITIONS

- A. Design Reference Sample: Sample of approved GFRC color, finish, and texture; preapproved by Architect.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: GFRC panels, including panel frames, anchors, and connections, shall withstand the following design loads as well as the effects of thermal- and moisture-induced volume changes, according to load factors and combinations established in PCI MNL 128, "Recommended Practice for Glass Fiber Reinforced Concrete Panels."
 - 1. Design Loads: As indicated on Structural Drawings.
 - 2. Deflection Limits: Design panel frames to withstand design loads without lateral deflections greater than 1/240 of wall span.
 - 3. Thermal Movements: Provide for thermal movements resulting from annual ambient temperature changes of 100 deg F (56 deg C).
 - 4. Design panel frames and connections to accommodate deflections and other building movements.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include GFRC design mixes.
- B. Shop Drawings: Show fabrication and installation details for GFRC panels including the following:
 - 1. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Panel elevations, sections, and dimensions.
 - 3. Thickness of facing mix, GFRC backing, and bonding pads for typical panels.
 - 4. Finishes.
 - 5. Joint and connection details.
 - 6. Erection details.
 - 7. Panel frame details for typical panels including sizes, spacings, thickness, and yield strength of various members.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- 8. Location and details of connection hardware attached to structure.
 - 9. Size, location, and details of flex, gravity, and seismic anchors for typical panels.
 - 10. Other items sprayed into panels.
 - 11. Erection sequence for special conditions.
 - 12. Relationship to adjacent materials.
 - 13. Description of loose, cast-in, and field hardware.
- C. Samples: Representative of finished exposed face of GFRC showing the full range of colors and textures specified, 12 by 12 inches (305 by 305 mm) and of actual thickness.
- D. Welding certificates.
- E. Steel Sheet Certification: For steel sheet used in cold-formed steel panel framing.
- F. Source Quality-Control Program: For GFRC manufacturer.
- G. Source Quality-Control Test Reports: For GFRC, inserts, and anchors.

1.6 QUALITY ASSURANCE

- A. Manufacturer Responsibility:
- 1. Manufacturer's responsibility includes fabricating GFRC panels and providing professional engineering services needed to assume engineering responsibility for GFRC panels.
 - 2. Engineering responsibility includes preparation of Shop Drawings and comprehensive engineering analysis, based on GFRC production test values, by a qualified professional engineer experienced in GFRC design.
- B. Steel Sheet Certifications: Obtain mill certificates signed by manufacturers of steel sheet, or test reports from a qualified testing agency, indicating that steel sheet used in cold-formed metal panel framing complies with requirements including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.
- C. Source Limitations: Obtain GFRC panels from single source from single manufacturer.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," and AWS D1.3, "Structural Welding Code - Sheet Steel."
- E. PCI Manuals: Comply with requirements and recommendations in the following PCI manuals unless more stringent requirements are indicated:
- 1. PCI MNL 128, "Recommended Practice for Glass Fiber Reinforced Concrete Panels."
 - 2. PCI MNL 130, "Manual for Quality Control for Plants and Production of Glass Fiber Reinforced Concrete Products."
- F. AISI Specifications: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- G. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
- 1. Build mockup of a typical exterior cornice as shown on Drawings as part of or separately from building.
 - 2. Build mockup of a typical exterior column as shown on Drawings as part of or separately from building.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- a. Include flush “invisible” joint for approval.
 - 3. Build mockup of a typical balustrade as shown on Drawings as part of or separately from building.
 - 4. In addition to GFRC panels, mockups include joint fillers and sealants.
 - 5. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
- H. Preinstallation Conference: Conduct conference at Project site.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Handle and transport GFRC panels to avoid damage.
 - 1. Place nonstaining resilient spacers between panels.
 - 2. Support panels on nonstaining material during shipment.
 - 3. Protect panels from dirt and damage during handling and transport.
 - B. Store GFRC panels to protect from contact with soil, staining, and physical damage.
 - 1. Store panels with nonstaining resilient supports in same positions as when transported.
 - 2. Store panels on firm, level, and smooth surfaces.
 - 3. Place stored panels so identification marks are clearly visible.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Arc Ltd.
 - 2. Casting Designs, Inc.
 - 3. Melton Classics, Inc.
 - 4. Stromberg Architectural Products, Inc.
 - 5. GFRC Cladding Systems, LLC.

2.2 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that will provide continuous and true GFRC surfaces; nonreactive with GFRC and capable of producing required finish surfaces.
 - 1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain, or adversely affect GFRC surfaces and will not impair subsequent surface or joint treatments of GFRC.
- B. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Provide solid backing and form supports to ensure that form liners remain in place during GFRC application. Use with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect GFRC surfaces and will not impair subsequent surface or joint treatments of GFRC.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.3 GFRC MATERIALS

- A. Portland Cement: ASTM C 150; Type I, II, or III.
 - 1. For surfaces exposed to view in finished structure, use white of same type, brand, and source throughout GFRC production.
 - 2. Metakaolin: ASTM C 618, Class N.
- B. Glass Fibers: Alkali resistant, with a minimum zirconia content of 16 percent, 1 to 2 inches (25 to 50 mm) long, specifically produced for use in GFRC, and complying with PCI MNL 130.
- C. Sand: Washed and dried silica, complying with composition requirements in ASTM C 144; passing No. 20 (0.85-mm) sieve with a maximum of 2 percent passing No. 100 (0.15-mm) sieve.
- D. Coloring Admixture: ASTM C 979, mineral-oxide pigments, temperature stable, nonfading, and alkali resistant.
 - 1. Titanium dioxide.
- E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of GFRC and complying with chemical limits of PCI MNL 130.
- F. Polymer-Curing Admixture: Acrylic thermoplastic copolymer dispersion complying with PCI MNL 130.
- G. Chemical Admixtures: ASTM C 494/C 494M, containing not more than 0.1 percent chloride ions.

2.4 ANCHORS, CONNECTORS, AND MISCELLANEOUS MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M. Finish steel shapes and plates less than 3/16 inch (4.76 mm) thick as follows:
 - 1. Finish: Zinc coated by hot-dip process according to ASTM A 123/A 123M, after fabrication, or ASTM A 153/A 153M, as applicable.
- B. Carbon-Steel Bars: ASTM A 108, AISI Grade 1018. Finish steel bars less than 3/16 inch (4.76 mm) thick as follows:
 - 1. Finish: Zinc coated by hot-dip process according to ASTM A 123/A 123M, after fabrication, or ASTM A 153/A 153M, as applicable.
- C. Malleable-Iron Castings: ASTM A 47/ A 47M, Grade 32510 (Grade 22010).
- D. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30 (Grade 415-205).
- E. Bolts: ASTM A 307 or ASTM A 325 (ASTM F 568M or ASTM A 325M).
 - 1. Finish: Zinc coated by hot-dip process according to ASTM A 123/A 123M, after fabrication, and ASTM A 153/A 153M, as applicable.
- F. Reglets: PVC extrusions.

2.5 PANEL FRAME MATERIALS

- A. Cold-Formed Steel Framing: Manufacturer's standard C-shaped steel studs, complying with AISI's "North American Specification for the Design of Cold-Formed Steel Structural

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

Members,” minimum uncoated steel thickness of 0.053 inch (1.34 mm), with stiffened flanges, U-shaped steel track, and of the following steel sheet:

1. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, structural-steel sheet, G60 (Z180) zinc coating, of grade required by structural performance of framing.
- B. Hollow Structural Sections: Steel tubing, ASTM A 500, Grade B, or ASTM A 513. Finish hollow structural sections with wall thickness less than 3/16 inch (4.76 mm) as follows:
 1. Organic Zinc-Rich Primer: SSPC-Paint 20 on surfaces prepared to comply with SSPC-SP 6/NACE No. 3, “Commercial Blast Cleaning.”
- C. Steel Channels and Angles: ASTM A 36/A 36M, finished as follows:
 1. Organic Zinc-Rich Primer: SSPC-Paint 20 on surfaces prepared to comply with SSPC-SP 6/NACE No. 3, “Commercial Blast Cleaning.”

2.6 GFRC MIXES

- A. Backing Mix: Proportion backing mix of portland cement, glass fibers, sand, and admixtures to comply with design requirements. Provide nominal glass-fiber content of not less than 5 percent by weight of total mix.
- B. Mist Coat: Portland cement, sand slurry, and admixtures; of same proportions as backing mix without glass fibers.
- C. Polymer-Curing Admixture: 6 to 7 percent by weight of polymer-curing admixture solids to dry portland cement.
- D. Coloring Admixture: Not to exceed 10 percent of cement weight.

2.7 PANEL FRAME FABRICATION

- A. Fabricate panel frames and accessories plumb, square, true to line, and with components securely fastened, according to Shop Drawings and requirements in this Section.
 1. Fabricate panel frames using jigs or templates.
 2. Cut cold-formed metal framing members by sawing or shearing; do not torch cut.
 3. Fasten cold-formed metal framing members by welding. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 4. Fasten framing members of hollow structural sections, steel channels, or steel angles by welding. Comply with AWS D1.1/D1.1M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 5. Weld flex, gravity, and seismic anchors to panel frames.
- B. Reinforce, stiffen, and brace framing assemblies, if necessary, to withstand handling, delivery, and erection stresses. Lift fabricated assemblies in a manner that prevents damage or significant distortion.
- C. Galvanizing Repair: Touch up accessible damaged galvanized surfaces according to ASTM A 780.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.8 MOLD FABRICATION

- A. Construct molds that will result in finished GFRC complying with profiles, dimensions, and tolerances indicated, without damaging GFRC during stripping. Construct molds to prevent water leakage and loss of cement paste.
 - 1. Coat contact surfaces of molds with form-release agent.
- B. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during GFRC application. Coat form liner with form-release agent.
- C. Locate, place, and secure flashing reglets accurately.

2.9 GFRC FABRICATION

- A. Proportioning and Mixing: For backing mix, meter sand/cement slurry and glass fibers to spray head at rates to achieve design mix proportions and glass-fiber content according to PCI MNL 130 procedures.
- B. Spray Application: Comply with general procedures as follows:
 - 1. Spray mist coat over molds to a nominal thickness of 1/8 inch (3 mm) on planar surfaces.
 - 2. Proceed with spraying backing mix before mist coat has set, using procedures that produce a uniform thickness and even distribution of glass fibers and matrix.
 - 3. Consolidate backing mix by rolling or other technique to achieve complete encapsulation of glass fibers and compaction.
 - 4. Measure thickness with a pin gage or other acceptable method at least once for each 5 sq. ft. (0.5 sq. m) of panel surface. Take not less than six measurements per panel.
- C. Hand form and consolidate intricate details, incorporate formers or infill materials, and over spray before material reaches initial set to ensure complete bonding.
- D. Attach panel frame to GFRC before initial set of GFRC backing, maintaining a minimum clearance of 1/2 inch (13 mm) from GFRC backing, and without anchors protruding into GFRC backing.
- E. Build up homogeneous GFRC bonding pads over anchor feet, maintaining a minimum thickness of 1/2 inch (13 mm) over tops of anchor feet, before initial set of GFRC backing.
- F. Inserts and Embedments: Build up homogeneous GFRC bosses or bonding pads over inserts and embedments to provide sufficient anchorage and embedment to comply with design requirements.
- G. Curing: Employ initial curing method that will ensure sufficient strength for removing units from mold. Comply with PCI MNL 130 procedures.
- H. Panel Identification: Mark each GFRC panel to correspond with identification mark on Shop Drawings. Mark each panel with its casting date.
- I. Design and fabricate column covers for minimum joint width to suit “invisible” flush joint filler as approved.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.10 FABRICATION TOLERANCES

- A. Manufacturing Tolerances: Manufacture GFRC panels so each finished unit complies with PCI MNL 130 for dimension, position, and tolerances.
- B. Position Tolerances: Measured from datum line locations, as indicated on Shop Drawings.
 - 1. Panel Frame and Track: Plus or minus 1/4 inch (6 mm).
 - 2. Flashing Reglets at Edge of Panel: Plus or minus 1/4 inch (6 mm).
 - 3. Inserts: Plus or minus 1/2 inch (13 mm).
 - 4. Special Handling Devices: Plus or minus 3 inches (75 mm).
 - 5. Location of Bearing Devices: Plus or minus 1/4 inch (6 mm).
 - 6. Blockouts: Plus or minus 3/8 inch (10 mm).
- C. Panel Frame Tolerances: As follows:
 - 1. Vertical and Horizontal Alignment: 1/4 inch per 10 feet (6 mm per 3 m).
 - 2. Spacing of Framing Member: Plus or minus 3/8 inch (10 mm).
 - 3. Squareness of Frame: Difference in length of diagonals of 3/8 inch (10 mm).
 - 4. Overall Size of Frame: Plus or minus 3/8 inch (10 mm).

2.11 FINISHES

- A. Finish exposed-face surfaces of GFRC as follows to match approved design reference sample and mockups. Panel faces shall be free of joint marks, grain, or other obvious defects.
 - 1. As-Cast-Surface Finish: Provide free of sand streaks, honeycombs, and excessive air voids, with uniform color and texture.
 - 2. Joints in Column Covers: Flush to and matching adjacent surfaces for “invisible” seam.

2.12 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Establish and maintain a quality-control program for manufacturing GFRC panels according to PCI MNL 130.
 - 1. Test materials and inspect production techniques.
 - 2. Quality-control program shall monitor glass-fiber content, spray rate, unit weight, product physical properties, anchor pull-off and shear strength, and curing period and conditions.
 - 3. Prepare test specimens and test according to ASTM C 1228, PCI MNL 130, and PCI MNL 128 procedures.
 - 4. Test GFRC inserts and anchors according to ASTM C 1230 to validate design values.
 - 5. Produce test boards at a rate not less than one per work shift per operator for each spray machine and for each mix design.
 - a. For each test board, determine glass-fiber content according to ASTM C 1229, and flexural yield and ultimate strength according to ASTM C 947.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine structure and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance of the Work.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Install clips, hangers, and other accessories required for connecting GFRC panels to supporting members and backup materials.
- B. Lift GFRC panels and install without damage.
- C. Install GFRC panels level, plumb, square, and in alignment. Provide temporary supports and bracing as required to maintain position, stability, and alignment of panels until permanent connections are completed.
1. Maintain horizontal and vertical joint alignment and uniform joint width.
 2. Remove projecting hoisting devices.
- D. Connect GFRC panels in position by bolting or welding, or both, as indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as possible after connecting is completed.
- E. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.3 requirements for welding, appearance, quality of welds, and methods used in correcting welding work.
1. Protect GFRC panels from damage by field welding or cutting operations, and provide noncombustible shields as required.
- F. At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.

3.3 ERECTION TOLERANCES

- A. Erect GFRC panels to comply with the following noncumulative tolerances:
1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch (13 mm).
 2. Top Elevation from Nominal Top Elevation: As follows:
 - a. Exposed Individual Panel: Plus or minus 1/4 inch (6 mm).
 - b. Nonexposed Individual Panel: Plus or minus 1/2 inch (13 mm).
 - c. Exposed Panel Relative to Adjacent Panel: 1/4 inch (6 mm).
 - d. Nonexposed Panel Relative to Adjacent Panel: 1/2 inch (13 mm).
 3. Support Elevation from Nominal Elevation: As follows:
 - a. Maximum Low: 1/2 inch (13 mm).
 - b. Maximum High: 1/4 inch (6 mm).
 4. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet (30 m): 1 inch (25 mm).
 5. Plumb in Any 10 Feet (3 m) of Element Height: 1/4 inch (6 mm).
 6. Maximum Jog in Alignment of Matching Edges: 1/4 inch (6 mm).
 7. Maximum Jog in Alignment of Matching Faces: 1/4 inch (6 mm).
 8. Face Width of Joint: As follows (governs over joint taper):
 - a. Panel Dimension 20 Feet (6 m) or Less: Plus or minus 1/4 inch (6 mm).
 - b. Panel Dimension More Than 20 Feet (6 m): Plus or minus 5/16 inch (8 mm).
 9. Maximum Joint Taper: 3/8 inch (10 mm).
 10. Joint Taper in 10 Feet (3 m): 1/4 inch (6 mm).

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

11. Differential Bowing, as Erected, between Adjacent Members of Same Design: 1/4 inch (6 mm).

3.4 REPAIRS

- A. Repairs will be permitted provided structural adequacy of GFRC panel and appearance are not impaired, as approved by Architect.
- B. Mix patching materials and repair GFRC so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces.
- C. Prepare and repair accessible damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.
- D. Remove and replace damaged GFRC panels when repairs do not comply with requirements.

3.5 CLEANING AND PROTECTION

- A. Perform cleaning procedures, if necessary, according to GFRC manufacturer's written instructions. Clean soiled GFRC surfaces with detergent and water, using soft fiber brushes and sponges, and rinse with clean water. Prevent damage to GFRC surfaces and staining of adjacent materials.

END OF SECTION 034900

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide structural 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 Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 - 1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Submit product data for masonry cleaner products recommended by unit masonry manufacturer for proposed unit masonry.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
 - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Qualification Data: For testing agency.
- D. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - c. For concrete masonry units, include data verifying compliance with ASTM C 33 for normal weight aggregates and ASTM C 331 for lightweight aggregates.
 - 2. Cementitious materials. Include brand, type, and name of manufacturer.
 - 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 4. Grout mixes. Include description of type and proportions of ingredients.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- 5. Reinforcing bars.
- 6. Joint reinforcement.
- 7. Anchors, ties, and metal accessories.
- E. 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 for air content.
 - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- F. 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 Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- G. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. 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.
- C. 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.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 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. In lieu of separate cementitious materials and aggregate, Contractor may deliver pre-blended dry mortar mix in moisture-resistant containers designed for use with dispensing silos.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT 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 (600 mm)** down both sides of walls and hold cover securely in place.
 2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of **24 inches (600 mm)** down face next to unconstructed wythe and hold cover 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 ACI 530.1/ASCE 6/TMS 602.
 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is **40 deg F (4 deg C)** 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 ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide bullnose units for exposed outside corners unless otherwise indicated. Provide square edge outside corners for all concealed conditions.
- B. CMUs: ASTM C 90.
1. Density Classification: Lightweight unless otherwise indicated.
 2. Aggregates:
 - a. Lightweight Aggregates: Lightweight aggregate used shall strictly comply with ASTM C 331. Drying shrinkage of aggregate shall not exceed 0.10 percent (%) at 100 days. The dry net unit weight shall not be more than 105 lbs. per cubic foot unless otherwise indicated.
 - b. Normal Weight Aggregates: Normal weight aggregate used shall strictly comply with ASTM C 33.
 3. Size: Actual size 7-5/8 inches (194 mm) high by 15-5/8 inches (397 mm) long unless indicated otherwise.
 - a. Width: Manufactured to dimensions 3/8 inch less than nominal dimensions.
 4. Exposed Faces: Provide color and texture matching existing.
- C. Concrete Building Brick: ASTM C 55.
1. Density Classification: Lightweight, unless noted otherwise.

2.3 CONCRETE AND MASONRY LINTELS

- A. General: Provide one of the following:
- B. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 03 Section "Cast-in-Place Concrete" and with reinforcing bars indicated. Precast U-lintels fabricated in accordance with performance standards of PCI MNL-116 with 3500 psi concrete for standard lintels and 6000 psi concrete for prestressed lintels as manufactured by Cast-Crete are acceptable in lieu of rectangular section lintels.
- C. Masonry Lintels: Prefabricated or Built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. 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 (6 mm)** thick, use aggregate graded with 100 percent passing the **No. 16 (1.18-mm)** sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
- D. Aggregate for Grout: ASTM C 404.
- E. 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.
- F. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, **Grade 60 (Grade 420)**.
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Interior Walls: Mill- galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 - 3. Wire Size for Side Rods: **0.148-inch (3.77-mm)** diameter.
 - 4. Wire Size for Cross Rods: **0.148-inch (3.77-mm)** diameter.
 - 5. Wire Size for Veneer Ties: **0.148-inch (3.77-mm)** diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than **16 inches (407 mm)** o.c.
 - 7. Provide in lengths of not less than **10 feet (3 m)**, with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair side rods.
- D. Masonry Joint Reinforcement for Multi-wythe Masonry:
 - 1. Composite Walls: Ladder type with 1 side rod at each face shell of hollow masonry units more than **4 inches (100 mm)** wide, plus 1 side rod at each wythe of masonry **4 inches (100 mm)** wide or less.
 - 2. Truss-type reinforcement consisting of four (4) side-rods welded to a continuous diagonally formed cross rod designed to bed rods at face shells of CMU, to suit CMU thicknesses and wall thickness. Use only for subgrade and composite walls; not for cavity wall construction.
 - 3. Ladder-type reinforcement consisting of four (4) side-rods welded to individual cross rods at no more than 16 inches on center, designed to bed rods at face shells of CMU, to suit CMU thicknesses and wall thickness. Use only for subgrade and composite walls; not for cavity wall construction.
 - 4. Rubble Stone Masonry Tie System: Horizontal masonry reinforcing system, either ladder or truss design, with projecting loops and factory-welded restraint bars, designed for flexible tie placement in rubble or random stone veneers. Provide compatible ties as needed and as approved for stone masonry work.
 - a. Wire-Bond; "Stone Tab."

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- b. Dur-O-Wal, Inc.; “Random Rubble Stone System” DA3300 Series.
- c. Hohmann & Barnard, Inc.; Tie-HVR-195V or 295V.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least **5/8-inch (16-mm)** cover on outside face. Outer ends of wires are bent 90 degrees and extend **2 inches (50 mm)** parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than **4 inches (100 mm)** wide.
 - 1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than **2 inches (50 mm)** long may be used for masonry constructed from solid units.
 - 2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of **1-1/4 inches (32 mm)**.
 - 3. Wire: Fabricate from **3/16-inch- (4.76-mm-)** diameter, hot-dip galvanized steel wire.
- D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section for Welding to Steel Frame: Crimped **1/4-inch- (6.35-mm-)** diameter, hot-dip galvanized steel wire.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within **1 inch (25 mm)** of masonry face, made from **0.187-inch- (4.76-mm-)** diameter, hot-dip galvanized steel wire.
- E. Rigid Anchors: Fabricate from steel bars **1-1/2 inches (38 mm)** wide by **1/4 inch (6.35 mm)** thick by **24 inches (610 mm)** long, with ends turned up **2 inches (51 mm)** or with cross pins unless otherwise indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.7 MISCELLANEOUS ANCHORS

- A. Anchor Bolts: Headed or L-shaped steel bolts complying with **ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6)**; with **ASTM A 563 (ASTM A 563M)** hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- B. Postinstalled Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or **ASTM F 1941** (**ASTM F 1941M**), Class Fe/Zn 5 unless otherwise indicated.
3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group **1** (**A1**) stainless-steel bolts, **ASTM F 593** (**ASTM F 738M**), and nuts, **ASTM F 594** (**ASTM F 836M**).

2.8 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with Division 07 Section “Flashing, Sheet Metal and Roofing Accessories” and as follows:
 1. Stainless Steel: ASTM A 167, Type 304 minimum 0.0187 inch (0.5 mm) thick.
 2. Fabricate continuous flashings in sections **96 inches** (**2400 mm**) long minimum, but not exceeding **12 feet** (**3.7 m**). Provide splice plates at joints of formed, smooth metal flashing.
 3. Fabricate through-wall flashing with snap-lock receiver on exterior face where indicated to receive counterflashing.
- B. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section “Flashing, Sheet Metal and Roofing Accessories.”
- C. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

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 or urethane.
- 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, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from **0.148-inch** (**3.77-mm**) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dayton Superior Corp., Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.10 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- 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. ChemMasters Corp.
 - 2. BASF Building Systems.
 - 3. Gardner Gibson, Inc.
 - 4. Henry Company.
 - 5. Karnak Corporation.
 - 6. Koppers Inc.
 - 7. Malarkey Roofing Products.
 - 8. Meadows, W. R., Inc.
 - 9. Tamms Industries, Inc.
- B. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
- C. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
- D. Miscellaneous Dampproofing Materials:
 - 1. Cut-Back Asphalt Primer: ASTM D 41.
 - 2. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
 - 3. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
 - 4. Patching Compound: Epoxy or latex-modified repair mortar, or manufacturer's fibered mastic of type recommended by dampproofing manufacturer.

2.11 CAVITY-WALL INSULATION

- A. Refer to Division 7 Section "Thermal Insulation" for cavity insulation.

2.12 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use Type M or Type S.
 - 2. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

- D. Grout for Unit Masonry: Comply with ASTM C 476 and notes on Structural Drawings.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.

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. Verify that foundations are within tolerances specified.
 - 2. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. 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.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of textures.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

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 (12 mm)** or minus **1/4 inch (6 mm)**.
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus **1/2 inch (12 mm)**.
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus **1/4 inch (6 mm)** in a story height or **1/2 inch (12 mm)** total.
- B. Lines and Levels:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. For bed joints and top surfaces of bearing walls do not vary from level by more than **1/4 inch in 10 feet (6 mm in 3 m)**, or **1/2 inch (12 mm)** 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 (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
3. For vertical lines and surfaces do not vary from plumb by more than **1/4 inch in 10 feet (6 mm in 3 m)**, **3/8 inch in 20 feet (9 mm in 6 m)**, or **1/2 inch (12 mm)** 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 (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
5. For lines and surfaces do not vary from straight by more than **1/4 inch in 10 feet (6 mm in 3 m)**, **3/8 inch in 20 feet (9 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than **1/4 inch in 10 feet (6 mm in 3 m)**, or **1/2 inch (12 mm)** maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than **1/16 inch (1.5 mm)** except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus **1/8 inch (3 mm)**, with a maximum thickness limited to **1/2 inch (12 mm)**.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than **1/8 inch (3 mm)**.
3. For head and collar joints, do not vary from thickness indicated by more than plus **3/8 inch (9 mm)** or minus **1/4 inch (6 mm)**.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus **1/8 inch (3 mm)**. Do not vary from adjacent bed-joint and head-joint thicknesses by more than **1/8 inch (3 mm)**.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than **1/16 inch (1.5 mm)** from one masonry unit to the next.

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 (100-mm)** 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 **2 inches (50 mm)**. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal **4-inch (100-mm)** horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

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 (600 mm)** under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. **Grout all hollow masonry and cavities solid below grade except where protected by waterproofing.**
- J. Build non-load-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. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units 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. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 COMPOSITE MASONRY

- A. Bond wythes of composite masonry together using one of the following methods **unless indicated otherwise:**
 - 1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement.
 - B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.
 - C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
 - 1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.
 - D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
 - 1. Provide rigid metal anchors not more than **24 inches (610 mm)** o.c. If used with hollow masonry units, embed ends in mortar-filled cores.
- 3.7 CAVITY WALLS
- A. Stone masonry veneer cavity walls shall be tied together using anchoring system indicated in Division 4 Section "Stone Masonry." Coordinate and provide anchor system to suit.
 - B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
 - C. On face of backup wythe, strike mortar joints flush and remove mortar droppings, leaving surface ready for air barrier and insulation installation.
 - D. Coat cavity face of backup wythe to comply with Division 07 Section "Bituminous Dampproofing" where indicated.
- 3.8 MASONRY JOINT REINFORCEMENT
- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of **5/8 inch (16 mm)** on exterior side of walls, **1/2 inch (13 mm)** elsewhere. Lap reinforcement a minimum of **6 inches (150 mm)**.
 - 1. Space reinforcement not more than **16 inches (406 mm)** o.c.
 - 2. Space reinforcement not more than **8 inches (203 mm)** o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than **8 inches (203 mm)** above and below wall openings and extending **12 inches (305 mm)** 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.
- 3.9 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:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Provide an open space not less than **1 inch (25 mm)** 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 (610 mm)** o.c. vertically and **36 inches (915 mm)** o.c. horizontally.

3.10 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.
 1. Principal movement joints are indicated on the drawings.
 2. Provide control joint spacing in above grade exposed concrete masonry (CMU) wall in accordance with NCMA recommendations (TEK 10-2B) of the lesser of wall length-to-height ratio of 1.5 to 1, or 25 feet. Confirm project-specific joint locations and details of additional expansion and control joints with Architect prior to installation to comply with TEK standard.
 - a. Provide at least one control joint within 24 inches of door and window openings 6 feet wide or less. Provide a control joint within 24 inches of each jamb for door and window openings over 6 feet wide.
- 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.

3.11 LINTELS

- A. Install steel lintels where indicated.
- B. Provide concrete or masonry lintels where **indicated** and **in accordance with structural notes for opening sizes**.
- C. Provide minimum bearing of **8 inches (200 mm)** at each jamb unless otherwise indicated.

3.12 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.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

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 ACI 530.1/ASCE 6/TMS 602.

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 ACI 530.1/ASCE 6/TMS 602 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 (1520 mm).

3.13 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Payment for these services will be made by Owner.
2. Retest materials failing to comply with specified requirements at Contractor's expense.

C. Testing Frequency: Tests and Evaluations for masonry units listed in this Article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof. Other testing will be performed at frequencies required in paragraphs below.

D. Mortar properties will be tested per ASTM C 780. Perform testing for first three days of construction and whenever mortar mix is altered or mixing techniques differ from accepted material test reports.

E. Sample and test grout compressive strength per ASTM C 1019. Perform testing for first three days of construction and whenever grout mix is altered or mixing techniques differ from accepted material test reports.

F. Concrete Masonry Unit Tests: For primary bearing concrete masonry units utilized in project, units will be tested according to ASTM C 140. Primary bearing unit size(s) are 8-inch for project, and additional size units if so required by Architect.

3.14 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.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

3.15 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 (100 mm) 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 Division 31 Section "Earth Moving."
 - 3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 047200 – CAST STONE MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Cast Stone shown on architectural drawings and as described in this specification.

1.2 RELATED SECTIONS:

- A. Section 04 05 13.23 - Surface Bonding Masonry Mortaring.
- B. Section 04 05 16.26 - Engineered Masonry Grouting- Masonry Grouting.
- C. Section 04 05 19.29 - Stone Anchors.
- D. Section 04 20 00 - Unit Masonry.
- E. Section 07 60 00 - Flashing and Sheet Metal
- F. Section 07 90 00 - Joint Protection

1.3 REFERENCES

- A. ACI 318 – Building Code Requirements for Reinforced Concrete.
- B. ASTM A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Reinforced Concrete.
- D. ASTM C 33 – Standard Specification for Concrete Aggregates.
- E. ASTM C 150 - Standard Specification for Portland Cement.
- F. ASTM C 595 – Blended Cement
- G. ASTM C 1157 – Hydraulic Cement
- H. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volume Method.
- I. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- J. ASTM C 260 - Standard Specification for Air-Entrained Admixtures for Concrete.
- K. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
- L. ASTM C 426 – Standard Test Method for Linear Shrinkage of Concrete Masonry Units.
- M. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete.
- N. ASTM C 618 – Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- O. ASTM C 666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
- P. ASTM C 979 - Standard Specification for Coloring Pigments for Integrally Pigmented Concrete.
- Q. ASTM C 989 – Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete.
- R. ASTM C 1116 – Standard Specification for Fiber Reinforced Concrete and Shotcrete.
- S. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone.
- T. ASTM C 1195 - Standard Test Method for Absorption of Architectural Cast Stone.
- U. ASTM C 1364 - Standard Specification for Architectural Cast Stone.

- V. ASTM D 2244 – Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

1.4 DEFINITIONS

- A. Cast Stone - a refined architectural concrete building unit manufactured to simulate natural cut stone, used in Division 4 masonry applications.
1. Dry Cast – manufactured from zero slump concrete.
 2. Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero-slump concrete against a rigid mold until it is densely compacted.
 3. Machine casting method: Manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.
 4. Wet Cast – Manufactured from measurable slump concrete.
 5. Wet casting method: Manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.
 6. Specifier Note: Slump, manufacturing method, and apparatus shall be selected by the manufacturer and not specified by the purchaser.

1.5 SUBMITTAL PROCEDURES

- A. Samples: Submit pieces of the Cast Stone that are representative of the general range of finish and color proposed to be furnished for the project.
- B. Test results: Submit manufacturers test results of Cast Stone previously made by the manufacturer.
- C. Shop Drawings: Submit manufacturers shop drawings including profiles, cross-sections, reinforcement, exposed faces, arrangement of joints (optional for standard or semi-custom installations), anchoring methods, anchors (if required), annotation of stone types and their location.
- D. Warranty: Submit Cast Stone Institute® Member Limited Warranty.
- E. Certification: Submit valid Cast Stone Institute® Plant Certification.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
1. Cast Stone shall be produced in a plant certified by the Cast Stone Institute®.
 2. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.
 3. Manufacturer shall submit a written list of projects similar in scope and at least three (3) years of age, along with owner, architect and contractor references.
- B. Standards: Comply with the requirements of the Cast Stone Institute® Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.
- C. Mock-up (Optional) Provide full size unit(s) for use in construction of sample wall. The approved mock-up shall become the standard for appearance and workmanship for the project.
- D. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CAST STONE

- A. Comply with ASTM C 1364
- B. Physical properties: Provide the following:
 - 1. Compressive Strength - ASTM C 1194: 6,500 psi minimum for products at 28 days.
 - 2. Absorption - ASTM C 1195: 6.0% maximum by the cold water method.
 - 3. Air Content – ASTM C 173 or C 231, for wet cast product shall be 4.0-8.0% for units exposed to freeze-thaw environments. Air entrainment is not required for Vibrant Dry Tamp (VDT) products.
 - 4. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5.0% after 300 cycles of freezing and thawing.
 - 5. Linear Drying Shrinkage – ASTM C 426: Test and report in accordance with ASTM C1364.
- C. Job site testing – One sample from production units may be selected at random from the field for each 500 cubic feet (14 m³) delivered to the job site.
 - 1. Three field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.
 - 2. Three field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6.0%.
 - 3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.

2.2 MATERIALS:

- A. Portland cement – Type I or Type III, white and/or grey, ASTM C 150.
- B. Coarse aggregates - Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the Vibrant Dry Tamp (VDT) casting method.
- C. Fine aggregates - Manufactured or natural sands, ASTM C 33, except for gradation.
- D. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
- E. Admixtures- Comply with the following:
 - 1. ASTM C 260 for air-entraining admixtures.
 - 2. ASTM C 494/C 495M Types A - G for water reducing, retarding, accelerating and high range admixtures.
 - 3. Other admixtures: Integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
 - 4. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

5. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.

F. Water – Potable

G. Reinforcing bars:

1. ASTM A 615/A 615M: Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in.
2. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.

H. Fiber reinforcement (optional): ASTM C 1116

I. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.

2.3 COLOR AND FINISH:

- A. Match sample on file in architect's office.
- B. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. and the density of such voids shall be less than 3 occurrences per any 1 in.² and not obvious under direct daylight illumination at a 5 ft distance.
- C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft distance.
 1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
 - a. Total color difference – not greater than 6 units.
 - b. Total hue difference – not greater than 2 units.
- D. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft distance.
- E. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.
- F. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.4 REINFORCING

- A. Reinforce the units as required by the drawings and for safe handling and structural stress.
- B. Minimum reinforcing shall be 0.25 percent of the cross section area.
- C. Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
- D. Units greater than 24 in. (600 mm) in one direction shall be reinforced in that direction. Units less than 24 in. (600 mm) in both their length and width dimension shall be non-reinforced unless otherwise specified.
- E. Welded wire fabric reinforcing shall not be used in dry cast products.

2.5 CURING

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- A. Cure units in a warm curing chamber approximately 100°F (37.8°C) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70°F (21.1°C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days @ 50°F (10°C) or 5 days @ 70°F (21°C) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.6 TOLERANCES

- A. Cross section dimensions shall not deviate by more than $\pm 1/8$ in. from approved dimensions.
- B. Length of units shall not deviate by more than length/ 360 or $\pm 1/8$ in., whichever is greater, not to exceed $\pm 1/4$ in.
 - 1. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
- C. Warp, bow or twist of units shall not exceed length/ 360 or $\pm 1/8$ in., whichever is greater.
- D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, $1/8$ in., on unformed sides of unit, $3/8$ in. maximum deviation.

2.7 PRODUCTION QUALITY CONTROL

- A. Testing.
 - 1. Test compressive strength and absorption from specimens taken from every 500 cubic feet of product produced.
 - 2. Perform tests in accordance ASTM C 1194 and C 1195
 - 3. Have tests performed by an independent testing laboratory every six months.
 - 4. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.
 - 5. Retain copies of all test reports for a minimum of two years.

2.8 DELIVERY, STORAGE AND HANDLING

- A. Mark production units with the identification marks as shown on the shop drawings.
- B. Package units and protect them from staining or damage during shipping and storage.
- C. Provide an itemized list of product to support the bill of lading.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installing contractor shall check Cast Stone materials for fit and finish prior to installation.
- B. Do not set unacceptable units.

3.2 SETTING TOLERANCES:

- A. Comply with Cast Stone Institute® Technical Manual.
- B. Set stones 1/8 in. or less, within the plane of adjacent units.
- C. Joints, plus - 1/16 in., minus - 1/8 in.

3.3 JOINTING

- A. Joint size:
 - 1. At stone/brick joints 3/8 in.
 - 2. At stone/stone joints in vertical position 1/4 in. (3/8 in. optional).
 - 3. Stone/stone joints exposed on top 3/8 in.
- B. Joint materials:
 - 1. Mortar, Type N, ASTM C 270.
 - 2. Use a full bed of mortar at all bed joints.
 - 3. Flush vertical joints full with mortar.
 - 4. Leave all joints with exposed tops or under relieving angles open for sealant.
 - 5. Leave head joints in copings and projecting components open for sealant.
- C. Location of joints:
 - 1. As shown on shop drawings.
 - 2. At control and expansion joints unless otherwise shown.

3.4 MATERIALS PREPARATION:

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Maintain paint mixing and application containers in a clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.5 SETTING

- A. Wet units with clean water prior to setting.
- B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
- C. Set units in full bed of mortar, unless otherwise detailed.
- D. Rake mortar joints 3/4 in. in for pointing.
- E. Remove excess mortar from unit faces immediately after setting.
- F. Tuck point unit joints to a slight concave profile

3.6 REPAIR AND CLEANING

- A. Repair chips with touchup materials furnished by manufacturer.
- B. Saturate units to be cleaned prior to applying an approved masonry cleaner.
- C. Consult with manufacturer for appropriate cleaners

3.7 INSPECTION AND ACCEPTANCE

- A. Inspect finished installation according to Cast Stone Institute® Technical Bulletin #36.
- B. Do not field apply water repellent until repair, cleaning, inspection and acceptance is completed.

END OF SECTION 047200

SECTION 054000 - COLD FORMED STEEL FRAMING – STRUCTURAL (CFSF-S)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. This Section includes the following structural cold-formed steel framing, noted as “CFSF-S.”
 - 1. Interior non-load-bearing wall framing indicated as “CFSF-S.”
 - 2. Exterior non-load-bearing wall framing.
 - 3. Soffit and ceiling joist framing.

1.3 DEFINITIONS

- A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thickness shall be permitted at bends due to cold forming.
- B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following: 1/240 of the span (joists, rafters, trusses) or wall height.
 - a. Interior Non-Load-Bearing Wall Framing designated as “CFSF-S:” Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.
 - 3. Exterior Non-Load-Bearing Framing: Horizontal deflection of **1/600** of the wall height. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch.
- B. Cold-Formed Steel Framing, General: Design according to AISI's “Standard for Cold-Formed Steel Framing - General Provisions.”
 - 1. Headers: Design according to AISI's “Standard for Cold-Formed Steel Framing - Header Design.”

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 1. For cold-formed steel framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Delegated-Design Submittal: For cold-formed steel framing – structural. Comply with performance requirements; structural and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation and licensed in the state where the project is located.
- D. Structural Calculations: Design calculations, erection drawings, and detail drawings shall be submitted for review. Such drawings shall indicate design assumptions, procedures, truss members forces and reactions, member sizes and gages, bridging, accessory installation and details to clearly indicate proper assembly of building components.
- E. Design calculations, erection drawings, and detail drawings shall be sealed and signed by a professional engineer registered in the State of North Carolina.

1.6 INFORMATIONAL SUBMITTALS

- A. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements.
- B. Welding certificates:
 1. Welders shall be AWS certified and shall be qualified for welding processes involved and, if pertinent, have undergone recertification.
- C. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
 1. Steel sheet.
 2. Expansion anchors.
 3. Power-actuated anchors.
 4. Mechanical fasteners.
 5. Vertical deflection clips.
 6. Horizontal drift deflection clips
 7. Miscellaneous structural clips and accessories.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.7 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed steel framing that are similar to those indicated for this Project in material, design, and extent.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed steel framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in the Contract Documents.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed steel framing, protect with a waterproof covering, and ventilate to avoid condensation.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed steel framing that may be incorporated into the Work include, but are not limited to, the following:

1. Allied Studco.
2. AllSteel Products, Inc.
3. Clark Steel Framing.
4. Consolidated Fabricators Corp.; Building Products Division.
5. Craco Metals Manufacturing, LLC.
6. Custom Stud, Inc.
7. Dale/Incor.
8. Dietrich Metal Framing; a Worthington Industries Company.
9. Formetal Co. Inc. (The).
10. MarinoWare; a division of Ware Industries.
11. SCAFCO Corporation.
12. Southeastern Stud & Components, Inc.
13. Steel Construction Systems.
14. United Metal Products, Inc.

2.2 MATERIALS

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: As required by structural performance.
 2. Coating: G60 (Z180).
- C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
 2. Coating: G90 (Z275).

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
 2. Flange Width: 1-5/8 inches (41 mm).
 3. Depth: 3-5/8 inches (92.1 mm), unless otherwise indicated.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
 2. Flange Width: 1-1/4 inches (32 mm).
- C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dietrich Metal Framing; a Worthington Industries Company.
 - b. MarinoWare, a division of Ware Industries.
 - c. SCAFCO Corporation
 - d. The Steel Network, Inc.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
1. Minimum Base-Metal Thickness: 0.0677 inch (1.72 mm).
 2. Flange Width: 1 inch (25 mm) plus the design gap for 1-story structures and 1 inch (25 mm) plus twice the design gap for other applications.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0677 inch (1.72 mm).
 - b. Flange Width: 1 inch (25 mm) plus the design gap for 1-story structures and 1 inch (25 mm) plus twice the design gap for other applications.
 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0677 inch (1.72 mm).
 - b. Flange Width: Dimension equal to sum of outer deflection track flange width plus 1 inch (25 mm).

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.4 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
 - 2. Flange Width: 1-5/8 inches (41 mm), minimum.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers, knee braces, and girts.
 - 9. Joist hangers and end closures.
 - 10. Hole reinforcing plates.
 - 11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- C. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Sealer Gaskets (Sill Sealer): ASTM C 665; Type 1, Class A, flexible unfaced fiber glass insulation, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's printed instructions, and requirements in this Section.
1. Fabricate framing assemblies using jigs or templates.
 2. Cut framing members by sawing or shearing; do not torch cut.
 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
 4. Fasten other materials to cold-formed steel framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's printed instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated. Install sill sealer under perimeter tracks.
- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches o.c., unless otherwise indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to studs and anchor to building structure.
 - 4. Connect drift clips to cold formed steel framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches (450 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - a. Install solid blocking at centers indicated on Shop Drawings.
 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 4. Bridging: Proprietary bridging bars installed according to manufacturer's printed instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).
 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches (51 mm) from abutting walls, and as follows:
 1. Joist Spacing: 16 inches o.c., unless otherwise indicated.
- D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's printed instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
 2. NLGA: National Lumber Grades Authority.
 3. RIS: Redwood Inspection Service.
 4. SPIB: The Southern Pine Inspection Bureau.
 5. WCLIB: West Coast Lumber Inspection Bureau.
 6. WWPA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Sustainable Design Submittals: Refer to Division 1 Section "Sustainable Design Requirements."

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preservative-treated wood: PPT
 2. Fire-retardant-treated wood: FT
 3. Power-driven fasteners.
 4. Powder-actuated fasteners.
 5. Expansion anchors.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
- B. Integrated Exterior Mockups: Attend preinstallation conference and provide rough carpentry work for integrated exterior mockup as specified in Division 1 section "Quality Requirements."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.
- C. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 - 1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPAC U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- D. Application: Treat items indicated on Drawings, and the following:
 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less and a smoke developed index of 450 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 1. Use treatment that does not promote corrosion of metal fasteners.
 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 4. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- E. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat items indicated on Drawings, and the following:
 - 1. Framing for raised platforms.
 - 2. Concealed blocking.
 - 3. Framing for non-load-bearing partitions.
 - 4. Roof construction.
 - 5. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Cants.
 - 5. Furring.
 - 6. Grounds.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:
 - 1. Mixed southern pine; SPIB.
 - 2. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - 3. Eastern softwoods; NeLMA.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
 - 1. Mixed southern pine; SPIB.
 - 2. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - 3. Eastern softwoods; NeLMA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.
- H. Screws for Fastening Parapet Nailers:
 - 1. For steel framing: #10 SIP low profile flat head screws intended for wood-to-metal connections, at spacing indicated.
 - a. Pullout capacity: 108 lb minimum in 43 mil (18 gauge) steel.
 - 2. For masonry backup: 1/4-inch diameter low profile flat head type concrete screw anchors, at spacing indicated. Length to suit embedment into CMU of 1-1/4 inches minimum.
 - a. Pullout capacity: 100 lb minimum at 1-inch embedment in face shell of hollow CMU.

2.7 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
- B. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesives 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."

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
 - 3. Provide barrier material between pressure preservative-treated lumber and steel deck or accessories, in accordance with SDI recommendations to prevent deck corrosion. Provide minimum 30-mil self-adhering, polymer-modified underlayment sheet such as W.R. Grace "Ice and Water Shield" or comparable product by Carlisle, Henry Co., Johns Manville, Owens Corning. Provide fasteners with hot-dip zinc coating complying with ASTM A 153 to secure pressure preservative-treated lumber at steel deck.
- H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

- I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- J. Unless indicated otherwise, where wood studs are indicated, provide nominal 2 x 4 wood stud framing at 16 inches on center.

3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
 - 1. For roofing work, comply with FM Global Loss Prevention Sheet 1-49 and roofing manufacturer's requirements.
- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF WOOD NAILERS AT PARAPETS

- A. General: Secure wood nailers and plywood to prepared substrate using mechanical fasteners to attain loading design requirements. Adhesive anchorage in lieu of mechanical fasteners for wood nailer anchorage is not acceptable.
 - 1. Coordinate with installation of continuous insulation and air barrier membrane materials to top of parapet substrate (preceding trade) and installation of roofing materials and coping assembly (subsequent trades).
- B. Installation at CMU Parapets: Secure parapet blocking to CMU with screw anchors in 2 rows at 64 inches on center, staggered, except within 10 feet of building corners provide 2 rows at 48 inches on center. Embedment length into CMU shall be 1-1/4-inch minimum. Install screw heads flush with uppermost surface of blocking or plywood sheathing if any. Install screws in accordance with manufacturer's instructions.
- C. Installation at CFSF-S Framed Parapets: Secure blocking to steel framing with screws in 2 rows at 16 inches on center, except within 10 feet of building corners provide 2 rows at 12 inches on center.
 - 1. Provide attachment to cold formed steel framing in accordance with APA Form No. T625C, Table 1 for 3/4-inch plywood panel thickness, wall stud spacing, and wind exposure category indicated.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3.4 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring at 24 inches o.c.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal-size furring vertically at 16 inches o.c.

3.5 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061600 – SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 - 3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Sustainable Design Submittals: Refer to Division 1 Section “Sustainable Design Requirements.”

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For following products, from ICC-ES:
 - 1. Preservative-treated plywood.
 - 2. Fire-retardant-treated plywood.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
- B. Integrated Exterior Mockups: Attend preinstallation conference and provide sheathing work for integrated exterior mockup as specified in Division 1 section “Quality Requirements.”

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

2.2 WOOD PANEL PRODUCTS

- A. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
 - 1. Fire-retardant-treatment shall not include ammonium phosphates for plywood sheathing.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. FRT Materials: Exposure to precipitation shall be avoided. If treated material does become wet, it shall be replaced or permitted to completely dry prior to being covered by other construction materials.
- E. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- A. Application: Treat plywood indicated on Drawings, and the following:
 - 1. Roof and wall sheathing within 48 inches of fire walls.

2.4 WALL SHEATHING

- A. Plywood Wall Sheathing: Exterior Exposure 1 sheathing.
 - 1. Nominal Thickness: As indicated. Not less than 1/2 inch.
- B. Glass-Mat Gypsum Sheathing: ASTM C 1177.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corporation; GlasRoc.
 - b. G-P Gypsum Corporation; Dens-Glass Gold.
 - c. National Gypsum Company; Gold Bond e(2)XP.
 - d. Temple-Inland Inc.; GreenGlass
 - e. United States Gypsum Co.; Securock.
 - 2. Type and Thickness: Regular, 1/2 inch thick.
 - 3. Size: 48-inch width by length suitable for installation.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153 unless indicated otherwise.
- B. Power-Driven Fasteners: NES NER-272.
- C. Wood Screws: ASME B18.6.1.
- D. Screws for Fastening Wood Structural Panels to Cold-Formed Steel Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
 - 1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- E. Screws for Fastening Gypsum Sheathing to Cold-Formed Steel Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - 1. For (CFSF-NS) steel framing less than 0.0329-inch-thick, use screws that comply with ASTM C 1002.
 - 2. For (CFSF-S) steel framing from 0.033- to 0.112-inch-thick, use screws that comply with ASTM C 954.

2.6 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing Board: Elastomeric, 100% solids, moisture-curing polyether joint sealant compatible with joint substrates formed by gypsum sheathing and other

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

materials, recommended by sheathing manufacturer for application indicated, and complying with requirements for elastomeric sealants specified in Division 7 Section "Joint Sealants."

1. Provide polyether based, 100% solids, moisture-curing elastomeric sealant.
 - a. York "GreatSeal LT-100 Liquid Tape.
 - b. Degussa "Sonnelastic 150."
 - c. STS Coatings "GreatSeal."

2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in the Construction Code.
- D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
 1. Comply with applicable recommendations in APA Form No. T625C, "Wood Structural Panels over Metal Framing Design/Construction Guide," for types of structural-use panels and applications indicated.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- a. Provide wall (including parapet) sheathing attachment to cold formed steel framing in accordance with Table 1 for panel thickness, wall stud spacing, and wind exposure category indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Screw to cold-formed steel framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 - c. Roof Sheathing: Provide "Ply-Clips" of type and spacing as recommended by APA for standard, square edged plywood roof sheathing, where sheathing is anchored directly to trusses and framing members.

3.3 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed steel framing with screws.
 - 2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
- D. Horizontal Installation: Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply polyether-based sealant with extended width nozzle for nominal 1-inch wide coverage to glass-mat gypsum sheathing board joints. Apply sealant to exposed fasteners heads with a trowel so fasteners are completely covered. Seal other penetrations and openings.
 - 2. Coordinate with subsequent application of air barrier system.

END OF SECTION 061600

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories, and finishing materials and processes.
 - 1. Include data for adhesives.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 2. Show locations and sizes of cutouts and holes for items installed in architectural woodwork.
 - 3. For blueprint-matched work, show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
- C. Samples for Initial Selection:
 - 1. Plastic Laminates
 - 2. PVC Edge Materials
 - 3. Solid Surfacing materials
- D. Samples for Verification:
 - 1. Lumber with or for transparent finish, not less than 5 inches wide by 24 inches long, for each species and cut, finished on 1 side and 1 edge. Include AWI premium grade required back-priming/sealing on 1 side and 1 edge.
 - 2. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
 - 3. Thermoset decorative-panels, 8 by 10 inches, for each type, color, pattern, and surface finish, with edge banding on 1 edge.
 - 4. Decorative resin glazing, 8 by 10 inches, for each type, color, pattern.
 - 5. Solid-surfacing materials, 6 inches square.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- 6. Corner pieces as follows:
 - a. Miter joints for standing trim.
- 7. Exposed cabinet hardware and accessories, one unit for each type and finish.
- E. Woodwork Quality Standard Compliance Provide proof of membership in AWI Quality Certification Program.
- F. Qualification Data: For fabricator.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Fabricator of products. Certified participant in AWI's Quality Certification Program.
- C. Quality Standard: Unless otherwise indicated, comply with "Architectural Woodwork Standards – Edition Two, October 2014 published jointly by Architectural Woodwork Institute (AWI), Woodwork Institute (WI), and Architectural Woodwork Manufacturer's Association of Canada (AWMAC) for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Obtain and pass a third party final inspection of installed architectural woodwork by the AWI Quality Certification Corporation. AWI program of self-certification by manufacturer in lieu of third party inspection is not acceptable.
- D. Accessibility Requirements: Where casework is indicated to comply with accessibility requirements, comply with the Department of Justice 2010 ADA Standards for Accessible Design.
- E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- F. Adhesives applied inside the weatherproofing system shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168 VOC limits as required for LEED. VOC limits correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits are reprinted in the LEED Reference Guide and are available from the Architect upon request.
 - 1. For carpet adhesive, concrete, wood, bamboo and cork floor finishes, and tile setting adhesives, compliance can be demonstrated with test results of:
 - a. Total volatiles fraction, based on one of the following, provided that water and exempt compounds are subtracted from total volatiles test results and the mass VOC content is calculated consistent with SCAQMD Rule 1113 and Rule 1168:
 - 1) ASTM D2369

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- 2) EPA method 24
 - 3) ISO 11890 part 1
 - b. Total volatile organic compounds fraction, based on one of the following, provided that all VOCs with a boiling point up to 280°C are included, and exempt compounds are subtracted from total volatiles test results and the mass VOC content is calculated consistent with SCAQMD Rule 1113 and Rule 1168.
 - 1) ASTM D6886
 - 2) ISO 11890 part 2
 - G. Sealants and sealant primers applied inside the weatherproofing system shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168 VOC limits as required for LEED.
 - 1. Architectural Sealants: 250 g/L or less.
 - 2. Other Sealants: 420 g/L or less.
 - 3. Architectural sealant primers (nonporous): 250 g/L or less.
 - 4. Architectural sealant primers (porous): 775 g/L or less.
 - 5. Other sealant primers: 750 g/L or less.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in “Project Conditions” Article.
- 1.6 PROJECT CONDITIONS
- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
 - B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
- 1.7 COORDINATION
- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no added urea formaldehyde.
 - 3. Particleboard: ANSI A208.1, Grade M-2.
 - 4. Softwood Plywood: DOC PS 1.
 - 5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
- C. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
 - 1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semi-exposed edges.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - a. Formica Group, Div. of Fletcher Building.
 - b. Panolam Industries International Inc. Nevamar Div.
 - c. Panolam Industries International Inc. Pionite Div.
 - d. Wilsonart LLC; Div. of Illinois Tool Works, Inc.
 - 2. Available "Thru-Color" Laminate Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Formica Group, Div. of Fletcher Building; "ColorCore2."
 - b. Nevamar; "MelCor II."
 - c. Panolam Industries International Inc.; Pionite "MelCor II."
- E. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Avonite, Inc.; "Avonite."
 - b. E. I. du Pont de Nemours and Company; "Corian."
 - c. Formica Group, Div. of Fletcher Building; "Solid Surfacing."
 - d. Hanwha L&C; "Hanex."
 - e. LG Hausys America; "HI-MACS."
 - f. Samsung, Cheil Industries Inc.; "Staron."

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- g. Wilsonart LLC, Div. of Illinois Tool Works, Inc.; "Solid Surface."
- 2. Type: Standard type, unless Special Purpose type is indicated.
- 3. Thickness: 1/2-inch (13 mm).
- 4. Colors and Patterns: As selected by Architect from manufacturer's full range.
- 5. Physical Characteristics
 - a. Fungal and Bacterial Resistance: No growth, per ASTM G 21 and G 22.
 - b. Tensile Strength: 4000 psi minimum per ASTM D 638.
 - c. Barcol Hardness: 56 minimum per ASTM D 2583.
 - d. Izod Impact Resistance: 0.28 ft-lb/in minimum per ASTM D 256 Method A.
 - e. Ball Impact Resistance: No fracture at 112 inch drop minimum per NEMA LD 3-3 (1/2 lb. ball on 1/2" material).
 - f. Stain Resistance: Pass per ANSI Z124.3 and/or ANSI Z124.6.
 - g. Boiling Water Resistance: No effect per NEMA LD 3-3 or ISSFA SST 8.1-00.
 - h. High Temperature Resistance: No effect per NEMA LD 3-3 or ISSFA SST 9.1-00.
 - i. Flame Spread: <25 per ASTM E 84.
 - j. Smoke Developed: <400 per ASTM E 84.
- F. Edgebanding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, 0.5 mm thick elsewhere.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.
 - 1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use the following treatment type:
 - 1. Interior Type A: Low-hygroscopic formulation.
 - 2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
 - 3. Kiln-dry materials before and after treatment to levels required for untreated materials.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 450 or less per ASTM E 84.
 - 1. For panels 3/4-inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
 - 2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
- D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware." Provide all hardware necessary for complete and functioning cabinets whether included in specification or not.
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, self-closing.
 - 1. Institutional Concealed Hinges (European Type): BHMA A156.9 Grade 1, 180-degree opening, zinc or nickel-plated steel finish as standard with manufacturer. Provide with additional screws and adjustment tabs as required by manufacturer to meet or exceed BHMA Grade 1 testing requirements.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
 - 1. Wire Pulls: Back-mounted, solid metal, 4 inches (100 mm) long, 5/16-inch (8 mm) in diameter.
- D. Catches: Roller catches, BHMA A156.9, B03071. Provide large roller catches, BHMA A156.9, B03112 for extra large cabinet doors, such as full-height cabinets.
- E. Shelf Rests: Injection-molded plastic friction fit 2-pin locking shelf rests complying with BHMA A156.9, Type B04013. Provide integral retaining clip to fit 3/4 inch or 1 inch thick shelving and provides non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure.
- F. Drawer Slides: Powder-coated, self-closing, heavy-duty drawer slides, designed to prevent drawer rebound; with nylon-tired, ball-bearing rollers; and meeting BHMA A156.9, Type B05011 (bottom edge mount) or B05051 (side mount), and rated as follows:
 - 1. Drawers except as noted: Minimum 100 lbf dynamic load rating at 50,000 cycles. Minimum 150 lb loading static edge load test rating for one minute duration on fully extended drawer. Provide standard (3/4) extension travel.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- 2. Paper Storage and File Drawers: Minimum 120 lbf dynamic load rating at 50,000 cycles. Minimum 150 lb loading static edge load test rating for one minute duration on fully extended drawer. Provide full extension travel.
 - G. Door Locks: BHMA A156.11, E07121.
 - H. Drawer Locks: BHMA A156.11, E07041.
 - I. Grommets for Cable Passage through Countertops: 2" black, molded-plastic grommets and matching removable plastic caps with slot for wire passage.
 - 1. Product: Provide equivalent to "SG series" by Doug Mockett & Company, Inc.
 - J. Wire Management: Extruded vinyl channel or trough shapes indicated. Black color and screw-mounting unless noted otherwise.
 - 1. Bulk wire manager for under counter applications, where indicated. Heavy wall 3 by 3-inch open top channel.
 - K. Fixed L-Shelf Brackets: Fixed L-bracket for shelf depth indicated for minimum 500 lb. loading capacity per pair of brackets. Steel construction with enamel finish, color selected by Architect.
 - 1. Basic L Bracket:
 - 2. L Bracket with Strut:
 - a. 12" deep x 8" height
 - b. 16" deep x 10" height
 - c. 20" deep x 13" height
 - d. 22" deep x 14" height
 - L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
 - M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.
- 2.4 MISCELLANEOUS MATERIALS
- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
 - B. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
 - C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
 - D. Steel Plates and Angles: ASTM A36, shop primed, (field paint in Division 9 Section "Paints"). (miscellaneous clips etc.)
 - E. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- F. VOC Limits for Installation Adhesives: Installation adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Multipurpose Construction Adhesives: 70 g/L.
 - 3. Contact Adhesive: 250 g/L.
- G. Adhesive for Bonding Plastic Laminate: Contact cement compliant with specified VOC limits.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or as specified above for faces.

2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4-inch Thick or Less: 1/16-inch.
 - 2. Edges of Rails and Similar Members More Than 3/4-inch Thick: 1/8-inch.
 - 3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16-inch.
- E. Unless indicated otherwise, where wood studs are indicated, provide nominal 2 x 4 wood stud framing at 16 inches (406 mm) on center.
- F. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- G. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.
- H. Install glass to comply with applicable requirements in Division 8 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.6 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Grade: Custom.
- B. Wood Species and Cut: Red oak, plain sawn.
 - 1. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
- C. For trim items wider than available lumber, use veneered construction. Do not glue for width.
- D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.
- E. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- F. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- G. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

2.7 PLASTIC-LAMINATE CABINETS

- A. Grade: Premium, except as noted for drawer construction.
- B. AWI Type of Cabinet Construction: Flush overlay.
 - 1. Cabinet Body Construction:
 - a. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24 inch deep cabinets and a minimum of 4 dowels each joint for 12 inch deep cabinets.
 - 1) Tops, bottoms and sides of all cabinets are 3/4-inch thick particleboard core.
 - b. Cabinet Backs - Semi-exposed: Minimum 3/8-inch thick prefinished particleboard or 1/4-inch thick medium-density fiberboard fully captured four sides or 1/2-inch prefinished particleboard full overlay construction. Provide 3/4-inch x 4 inch anchor or hanging strip except where backs are 1/2-inch or thicker per AWI standard.
 - c. Provide either of the following types of base construction to support cabinet load transfer, isolate the cabinet ends from contact with floor, and permit leveling.
 - 1) Separate Sub-base: Cabinet sub-base shall be separate and continuous (no cabinet body sides-to-floor), exterior grade plywood with concealed fastening to cabinet bottom. Sub-base shall be ladder-type construction of individual front, back, and intermediates, to form a secure and level platform to which cabinets attach. Recess sub-base at exposed cabinet end panels 1/4 inch from face of finished end, for flush installation of finished base material by other trades.
 - 2) Integral Base: Provide end panels, cabinet bottoms, and horizontal toe kick members integrally joined together for structural strength and to facilitate load transfer directly through cabinet ends to the floor. Provide 1-3/8" x 3" x 3/8" thick injection molded, chemical resistant, polypropylene isolation

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

supports factory-applied at the four corners of each toe base to prevent cabinets from contacting the floor. Internally-mount isolation supports to permit surface-application of continuous resilient base.

- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS.
 - 2. Vertical Surfaces: Grade VGS.
 - 3. Cabinet Body and Shelf Edges: PVC tape, 0.5 mm (0.018-inch) minimum thickness, matching laminate in color, pattern, and finish.
 - 4. Door and Drawer Front Edges: PVC edge banding, 3 mm (0.12-inch) thick, matching laminate in color, pattern, and finish. Provide “eased” edges and corners.
- D. Materials for Semi-exposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS
 - a. Edges of Plastic-Laminate Shelves: PVC tape, 0.018-inch (0.460-mm) minimum thickness, matching laminate in color, pattern, and finish.
 - b. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
 - 2. Drawer Sides and Backs: Per AWI standard for “Custom” Grade, 1/2 inch minimum.
 - 3. Drawer Bottoms: Per AWI standard for “Custom” Grade. Provide minimum 1/2 inch thick thermoset decorative-panels or particleboard with CLS (.020) laminate both sides or 1/4-inch thick thermally fused melamine clad medium-density fiberboard fully captured four sides.
- E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. Selected by Architect from laminate manufacturer’s full range (standard and premium lines) of product in standard textured finish (textured gloss, fine textured or suede finish). High gloss, heavy textured, metallic, or other special surface products (abrasion-resistant, chemical-resistant) will not be required for use in this project.
- G. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.8 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Comply with AWI Section 11 requirements for high-pressure decorative laminate countertops. Provide balanced construction for HDPL-faced core panel countertops.
 - 1. Drawings indicate traditional 3/4-inch core material and 1-1/2-inch built-up counter edge, edged with transparent finish hardwood.
- B. Grade: Custom.
- C. High-Pressure Decorative Laminate Grade: HGS.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. Selected by Architect from laminate manufacturer's full range (standard and premium lines) of product in standard textured finish (textured gloss, fine textured or suede finish). High gloss, heavy textured, metallic, or other special surface products (abrasion-resistant, chemical-resistant) will not be required for use in this project.
 - 2. As indicated by manufacturer's designations.
 - 3. As selected by Architect from manufacturer's full range in the following categories:
 - a. Solid colors, matte finish.
 - b. Solid colors with core same color as surface, matte finish.
 - c. Wood grains, matte finish.
 - d. Patterns, matte finish.
- E. Grain Direction: Parallel to cabinet fronts.
- F. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- G. Core Material: Particleboard or medium-density fiberboard.
- H. Core Material at Sinks: Use one of the following for countertops containing sinks. No exceptions:
 - 1. Flakeboard Co. "Duraflake MR" particleboard.
 - 2. Rodman Industries "Resincore I" particleboard.
 - 3. Roseburg Forest Products Co.; "Skyblend MR" particleboard.
 - 4. Shop-sanded exterior grade veneer-core plywood, minimum 5-ply, 3/4 inch thickness.
- I. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

2.9 SOLID-SURFACING-MATERIAL COUNTERTOPS

- A. Grade: Custom.
- B. Solid-Surfacing-Material Thickness: 1/2-inch (13 mm).
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
 - 1. As selected by Architect from manufacturer's full range.
- D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate tops with shop-applied edges of materials and configuration indicated.
 - 2. Fabricate tops with loose backsplashes for field application.
- E. Install integral sink bowls in countertops in shop.
- F. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

2.10 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. General: Shop finish transparent-finished interior architectural woodwork at fabrication shop as specified in this Section. Refer to Division 9 painting Sections for finishing opaque-finished architectural woodwork.
- C. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished items specified to be field finished. Refer to Division 9 painting Sections for material and application requirements.
- D. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.
- E. Transparent Finish:
 - 1. Grade: Premium.
 - 2. AWI Finish System: Acrylic lacquer.
 - 3. Staining: Match approved sample for color.
 - 4. Filled Finish for Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.
 - a. Apply wash-coat sealer after staining and before filling.
 - 5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8-inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches (900 mm) long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 - 2. Install wall railings on indicated metal brackets securely fastened to wall framing.
 - 3. Install standing and running trim with no more variation from a straight line than 1/8-inch in 96 inches (3 mm in 2400 mm).
- H. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8-inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.
 - 3. Resilient base at base cabinets (all exposed sides) is specified in Division 9 Section "Resilient Base and Accessories."
 - 4. For removable panels, provide zee clips. Arrange panel clearances to adjacent work to allow removal. At under-sink cabinetry access panels, provide steel cable retainer of a length that allows the removable panel to be set aside for clear service access, secured with tamper-resistant fasteners. Alternatively, provide a lock to secure the panel.
 - 5. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
 - 6. Present keys to Owner's representative. Identify keys by room number and casework type and turn over to Construction Manager.
- I. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install countertops with no more than 1/8-inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 3. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c..
 - 4. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- J. Window Stools: Anchor securely by approved concealed method underside of window stools.
 - 1. Align adjacent solid-surfacing-material window stool sections of multi-piece stools and form seams to comply with manufacturer's written recommendations using adhesive in color to match stools. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install window stools with no more than 1/8-inch in 96-inch sag, bow, or other variation from a straight line.
 - 3. Caulk space between window stools and both window unit and wall jambs with sealant specified in Division 7 Section "Joint Sealants."
- K. Pencil Sharpener Blocks: Mount each block with four (4) stainless steel or brass finish screws at 44 inches above finish floor to center of block. Evenly space fasteners from each corner of block. Verify 1'-0" clear on each side to adjacent wall, casework or other perpendicular surfaces.
 - 1. Install pencil sharpener centered within each pencil sharpener block.
- L. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- M. Refer to Division 9 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 072726 - FLUID-APPLIED VAPOR-RETARDING MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. ABAA: Air Barrier Association of America.
- B. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- C. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- D. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Refer to Division 01 Section "Exterior Building Enclosure Air Barrier Requirements" for air barrier system pre-installation conference guide
 - 2. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.
 - 2. Low-Temperature Product: Provide separate product data for low-temperature formulation product for application temperatures < 40°F, if applicable.
- B. Sustainable Design Submittals: Refer to Division 1 Section "Sustainable Design Requirements."
- C. Shop Drawings: For air-barrier assemblies.
 - 1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
 - 2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 - 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
- B. Integrated Exterior Mockups: Attend preinstallation conference and provide air barrier system components for integrated exterior mockup as specified in Division 1 section "Quality Requirements."
- C. Air Barrier Manufacturer's Technical Representative Field Review: Air Barrier manufacturer's technical representative shall review the work and provide copies of his observations in the form of a technical report to the Architect and the Owner. The Air Barrier Installer is responsible to notify the manufacturer's technical representative of intended start date and schedule of Air Barrier work.
 - 1. The Installer and Air Barrier manufacturer's technical representative shall review the substrate surfaces (wall) to receive Air Barrier system prior to beginning installation.
 - 2. The Air Barrier manufacturer's technical representative shall visit the site to review the work no less than three times (startup, in-progress, and end-of-installation inspection) during the application of the system & submit copies of technical reports to the Architect and Owner within 7 days of the site visit.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store rolls according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
 - 1. Protect substrates from environmental conditions that affect air-barrier performance.
 - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.9 WARRANTY

- A. Installation Warranty: Provide air barrier installer's 2-year warranty from date of Substantial Completion, including all components of the air barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, and failure to cure properly.
- B. Material Warranty: Provide the manufacturer's five-year air barrier material warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and accessories from a single source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.
- C. Low Temperature Products: When approved by Architect, provide low-temperature version of air barrier products for applications in temperatures below manufacturer's application temperature limit for primary product. Where such a product is not approved as equivalent to specified product, application at lower temperature will not be allowed.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR RETARDING

- A. High-Build, Vapor-Retarding Air Barrier: synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.
 - 1. Synthetic Polymer Type Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle; Fire Resist Barritech NP.
 - b. Henry Company; Air-Bloc 32MR.
 - c. Meadows, W. R., Inc.; Air-Shield LSR.
 - 2. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
 - b. Vapor Permeance: Maximum 0.1 perm; ASTM E 96, Desiccant Method.
 - c. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541.
- e. Fire Propagation Test: Membrane air barrier products located in exterior wall assemblies that have been tested in accordance with NFPA 285 which represent those exterior wall assemblies for this Project.
- f. UV Resistance: Can be exposed to sunlight for 90 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless-Steel Sheet: ASTM A 240, Type 304, 0.0187-inch-thick, and Series 300 stainless-steel fasteners.
- D. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft. density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- E. Preformed Silicone Extrusion (Engineered Transition Assembly): Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates. Provide prefabricated corners; field-assembled corners are not acceptable. Products include but are not limited to the following:
 - 1. Dow Corning; "Silicone Transition Strip" and "758 Silicone Weatherbarrier."
 - 2. Elbex; "Elbex HS" and compatible Dow or GE silicone sealant.
 - 3. Momentive Performance (GE); "UltraSpan" US1101 and GE "SilPruf."
 - 4. Pecora; "XL-Span" and "AVB Silicone."
 - 5. Tremco; "Proglaze ETA" and "Spectrem 1 Silicone."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
- H. Bridge isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

- A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
 3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials. Incorporate engineered transition assembly (ETA).

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
 - 1. Transition Strip: Roll firmly to enhance adhesion.
- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- H. Seal top of through-wall flashings to air barrier with an additional 6-inch-wide, transition strip.
- I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
- B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.
 - 1. Vapor-Retarding, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils, applied in one or more equal coats.
- C. Do not cover air barrier until it has been tested and inspected by testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3.5 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. ABAA Site Inspections: Arrange and pay for site inspections by ABAA to verify conformance with the manufacturer's instructions, the ULC S705.2 Installation standard, the ABAA Quality Assurance Program, and this section of the project specification.
 - 1. Unless indicated otherwise, provide ABAA Quality Assurance Program audits in accordance with current "Frequency & Cost of Audits" posted on ABAA website. Forward written inspection reports to the Architect within 10 working days of the inspection and test being performed. In the case of any deficiencies, the ABAA-licensed inspector may verbally advise the licensed installer at the time of the inspection.
 - 2. If the inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Owner.
 - 3. In addition to the ABAA site inspector, the air barrier manufacturer's technical representative will make field reviews during installation and provide technical reports to Contractor, Owner and Architect.
- C. Provide access for air barrier manufacturer's technical representative to make inspections. Coordinate and cooperate with those inspections. Do not allow erection of veneers or other materials to cover up air barrier prior to inspections.
- D. Air barriers will be considered defective if they do not pass tests and inspections.
 - 1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
 - 2. Remove and replace deficient air-barrier components for retesting as specified above.
- E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 - 1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
 - 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITION

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated
- B. Samples for Initial Selection: For each type of asphalt shingle, ridge and hip cap shingles, and exposed valley lining indicated.
 - 1. Include similar Samples of trim and accessories involving color selection.
- C. Samples for Verification: For the following products, of sizes indicated, to verify color selected:
 - 1. Asphalt Shingle: Full size.
 - 2. Vented Ridge and Hip Cap: Full size x 12"
 - 3. Exposed Valley Lining: 12 inches (300 mm) square.
 - 4. Self-Adhering Underlayment: 12 inches (300 mm) square.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.
- C. Research/Evaluation Reports: For each type of asphalt shingle required, from the ICC.
- D. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of asphalt shingle to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain ridge and hip cap shingles, ridge and eave vents, and underlayment from single source from single manufacturer except where other products are approved in writing by the shingle manufacturer without affecting the shingle manufacturer's warranty.
- C. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.

D. Preinstallation Conference: Conduct conference at Project site

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
- B. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members. Do not store shingles on roof surfaces.
- C. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install asphalt shingles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.9 WARRANTY

- A. Special Warranty: Manufacturer shall agree to repair or replace asphalt shingles that fail within specified warranty periods below.
 1. Failures include, but are not limited to, the following:
 - a. Manufacturing defects.
 - b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.
 2. Material Warranty Period: 50 years from date of Substantial Completion, prorated, with first 15 years nonprorated.
 3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 130 mph for five years from date of Substantial Completion.
 4. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor for 10 years from date of Substantial Completion.
- B. Special Project Warranty: Roofing Installer's Warranty, or warranty form at end of this Section, signed by roofing Installer, covering the Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Asphalt Shingles: 100 sq. ft of each type, in unbroken bundles.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: ASTM D 3462, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. GAF Materials Corporation.
 - b. Owens Corning.
 - c. TAMKO Roofing Products, Inc.
 - 2. Butt Edge: Straight cut.
 - 3. Strip Size: Manufacturer's standard.
 - 4. Algae Resistance: Granules treated to resist algae discoloration.
 - 5. Color and Blends: As selected by Architect from manufacturer's full range.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.2 UNDERLAYMENT MATERIALS

- A. Self-Adhering Sheet Underlayment, Granular Surfaced (RFA1 & RFA3): ASTM D 1970, minimum of 55-mil-thick sheet; glass-fiber-mat-reinforced, SBS-modified asphalt; mineral-granule surfaced; with release paper backing; cold applied.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ALCO-NVC Inc.
 - b. Carlisle Construction Materials.
 - c. GAF Materials Corporation.
 - d. GCP Applied Technologies, Inc.
 - e. Henry Company.
 - f. Owens Corning.
 - g. Protecto Wrap Company.
 - h. Tamko Building Products, Inc.

2.3 VENTILATED ROOF INSULATION NAILER PANELS

- A. Plywood Roof Sheathing (RFA1): Exterior, Exposure 1 Sheathing, 5/8-inch thick.
- B. Vented, Plywood-Surfaced, Polyisocyanurate-Foam Sheathing (RFA3): Rigid, cellular, polyisocyanurate thermal insulation complying with ASTM C 1289, Type II, Class 1, with nailbase adhered to spacers on one face.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cornell Corporation; Vent-Top ThermaCal 1.
 - b. Hunter Panels, LLC.; Cool-Vent.
 - c. Johns Manville; Vented Nailboard.
2. Coordinate use of vented composite nail base insulated roof sheathing with eave, ridge and related ventilation accessories specified as roofing accessories.
3. Polyisocyanurate-Foam Thickness: As required to achieve R-Value indicated on the drawings.
4. Plywood Nailbase Nominal Thickness: 5/8-inch APA Rated Sheathing – Exposure 1 veneer plywood. (7/16-inch OSB not acceptable).
5. Spacers: Wood furring strips or blocks not less than 1 inch thick and spaced not more than 12 inches o.c. Wood spacer blocks shall not exceed 8 percent of the panel area (92 percent open) and shall have 50 percent open for lateral (cross-slope) ventilation. Provide the following minimum ventilation requirements for slope applications indicated.
 - a. Cross Section: Net free area/lineal foot of 9.5 sq. in/lineal ft. up-slope and 7.5 sq. in/lineal ft. cross-slope.

2.4 SUBSTRATE BOARD

- A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, ½-inch thick.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistant provisions in FM Approvals 4470, designated for fastening substrate board to roof deck.

2.5 VAPOR RETARDER/AIR BARRIER

- A. Self-Adhering, Vapor Retarder/Underlayment Sheet (RFA1): Slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 1. Thickness: 30 mils minimum.
 2. Air leakage: Less than 0.004 CFM/sq ft @ 1.6 lbs/sq ft (75 Pa.) per ASTM E2178.
 3. Vapor Permeance: 0.05 perms maximum per ASTM E96.
 4. Low Temperature Flexibility: -20 degrees F per ASTM D1970: Pass.
 5. Elongation: 200% per ASTM D412-modified.
 6. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
 7. Adhesion: 3.0 lbs/in. width (525 N/m) minimum per ASTM D903 for plywood.
 8. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Henry Company; “Blueskin RF200.”
 - b. Grace, W. R. & Co.; “Ice and Water Shield.”
 - c. Owens Corning; “WeatherLock.”

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.6 RIDGE VENTS

- A. Rigid Ridge Vent (RFA1 & RFA3): Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with external deflector baffles; for use under ridge shingles, preformed or adjustable to slope indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Air Vent, Inc.; a Gibraltar Industries company.
 - b. Benjamin Obdyke, Incorporated.
 - c. Cor-A-Vent, Inc.
 - d. GAF Materials Corporation.
 - e. Lomanco, Inc.
 - f. Mid-America Siding Components; the Tapco Group.
 - g. Owens Corning.
 - h. Quarrix Building Products.
 2. Minimum Net Free Area: 18 square inches per linear foot.
 3. Width: Nominal 12 inches of shingle-over width.

2.7 EAVE VENTS

- A. Eave Vent (RFA1): Manufacturer's standard, low profile, rigid section high-density polypropylene or other UV-stabilized plastic eave vent with baffles and/or filters to provide weather protection; for use under shingles.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Air Vent, Inc.; a Gibraltar Industries company.
 - b. Cor-A-Vent, Inc.
 - c. GAF Materials Corporation.
 - d. Lomanco Inc.
 - e. Owens Corning.
 2. Minimum Net Free Area: 9 square inches per linear foot.

2.8 ROOF-TO-WALL VENTS

- A. Roof-to-Wall Concealed Vent: Manufacturer's standard, low profile, rigid section high-density polypropylene or other UV-stabilized plastic vent with baffles and/or filters to provide weather protection; for use under shingles to vent roof at high point where it meets a wall. Design shall incorporate special features to reduce leakage from drifting snow. Provide metal flashing to suit where flashing is not part of vent design.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cor-A-Vent, Inc.; Roof-2-Wall-Vent.
 - b. DCI Products; SmartVent Shed Wall.
 - c. Lomanco Inc.; Omni-Wall Vent.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Roof-to-Wall Metal Vent: Manufacturer's standard, pre-fabricated vent system consisting of formed aluminum, weather baffles, and insect screening. Design shall incorporate special features to reduce leakage from drifting snow. Provide metal flashing to suit where flashing is not part of vent design.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Atlas Roofing Corp.; Techni-Flo RV, Slope to High Wall Version.
 - b. Metal-Era; Hi-Perf Ridge Vent, Roof to Wall Version.
 - c. Pac-Clad; SS Ridge Vent – Slope to High Wall.

2.9 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch-diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch-diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

2.10 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."
1. Sheet Metal: Copper
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.
1. Apron Flashings: Fabricate with lower flange a minimum of 4 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
 2. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 4 inches over the underlying asphalt shingle and up the vertical surface.
 3. Cricket Flashings: Fabricate with concealed flange extending a minimum of 24 inches beneath upslope asphalt shingles and 6 inches beyond each side of skylight and 6 inches above the roof plane.
 4. Open-Valley Flashings: Fabricate in lengths not exceeding 10 feet with 1-inch-high, inverted-V profile at center of valley and equal flange widths of 12 inches. Conform to SMACNA 6th edition Figure 4-10.
 5. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof-deck flange and 3-inch fascia flange with 3/8-inch drip at lower edge.
 - a. Cleat: continuous perforated cleat, copper
- C. Vent Pipe Flashings: Round flanged base unit of 0.060-inch spun aluminum or rectangular flanged base unit of zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.052-inch-thick with welded or sealed mechanical corner joints. Provide EPDM or other non-

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

deteriorating resilient cap section with multiple graduated “boot” elements and stainless-steel draw-bands of quantity and size to suit penetrating pipe and conduit elements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 VAPOR-RETARDER/AIR BARRIER INSTALLATION

- A. Self-Adhering-Sheet Vapor Retarder/Air Barrier: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder/air barrier, side and end lapping each sheet a minimum of 3-1/2 inches and 6 inches, respectively. Seal laps by rolling.
 - 1. Coordinate placement of vapor retarder/air barrier underlayment over metal roof deck with other components of the building envelope to accomplish the air-tightness of the building enclosure which constitutes the total air barrier system specified in Division 1 Section “Exterior Enclosure Air Barrier Requirements.”
- B. Completely seal vapor retarder/air barrier at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.3 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install insulation under area of roofing to achieve required thickness. Install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
 - 1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
 - 2. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install a minimum of two layers of polyisocyanurate insulation under area of roofing, for a total thickness of 5 inches, to achieve a cumulative Long Term Thermal Resistance (LTTR) value of

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

28.5 per ASTM C1289-13 (insulation only), with top layer of insulation being vented nailbase sheathing. Install the layers of insulation and sheathing with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Adhered Insulation: Install each layer of insulation to deck using insulation manufacturer's recommended adhesive, specifically designed for securing specified board-type roof insulation to deck type, as indicated below.
 - 1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
- H. Install roof sheathing over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt sheathing boards together and secure through metal roof deck with mechanical fasteners. Fasteners shall not penetrate bottom flanges of steel roof deck.
 - 1. Remove fasteners which penetrate bottom flanges of exposed acoustical roof deck and replace with properly located fasteners as required. Restore exposed acoustical roof deck to Owner's satisfaction.

3.4 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Self-Adhering Sheet Underlayment: Install, wrinkle free, full coverage on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install full coverage across full surface of roof deck, lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
 - 1. After installation of eave vents, install underlayment over eave vent, lapped under roof deck underlayment to shed water.

3.5 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."
 - 1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.
- C. Step Flashings: Install with a headlap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Cricket Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.
- E. Open-Valley Flashings: Install centered in valleys, lapping ends at least 8 inches in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.
 - 1. Secure hemmed flange edges into metal cleats spaced 12 inches apart and fastened to roof deck.
 - 2. Adhere 9-inch-wide strip of self-adhering sheet to metal flanges and to self-adhering sheet underlayment.
- F. Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.
- G. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.
- H. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.6 ASPHALT SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Eave Vents: Install continuous eave vents prior to installation of asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing. Install a layer of underlayment over installed eave vent.
- C. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed with self-sealing strip face up at roof edge.
 - 1. Extend asphalt shingles 3/4 inch over fasciae at eaves and rakes.
 - 2. Install starter strip along rake edge.
- D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with 1/2-tab (minimum 4 inch) offset pattern at succeeding courses, maintaining uniform exposure.
- E. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- F. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.
- G. Fasten asphalt shingle strips with a minimum of four roofing nails located according to manufacturer's written instructions.
 - 1. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.
- H. Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips. Maintain uniform width of exposed open valley from highest to lowest point.
 - 1. Set valley edge of asphalt shingles in a 3-inch-wide bed of asphalt roofing cement.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Do not nail asphalt shingles to metal open-valley flashings.

- I. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- J. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

3.7 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: <Insert name of Owner>.
 2. Address: <Insert address>.
 3. Building Name/Type: <Insert information>.
 4. Address: <Insert address>.
 5. Area of Work: <Insert information>.
 6. Acceptance Date: <Insert date>.
 7. Warranty Period: <Insert time>.
 8. Expiration Date: <Insert date>.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding <Insert wind speed> mph (m/sec);
 - c. Fire;
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. Vapor condensation on bottom of roofing; and
 - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
 6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
 7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.
- E. IN WITNESS THEREOF, this instrument has been duly executed this **<Insert day>** day of **<Insert month>**, **<Insert year>**.
1. Authorized Signature: **<Insert signature>**.
 2. Name: **<Insert name>**.
 3. Title: **<Insert title>**.

END OF SECTION 073113

SECTION 074213 - METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITION

- A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight wall system.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Air Infiltration: Air leakage through assembly of not more than **0.06 cfm/sq. ft. (0.3 L/s per sq. m)** of wall area when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: **1.57 lbf/sq. ft. (75 Pa)**.
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: **6.24 lbf/sq. ft. (300 Pa)**.
- D. Water Penetration under Dynamic Pressure: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-acting, wind-load design pressure of not less than **6.24 lbf/sq. ft. (300 Pa)** and not more than **12 lbf/sq. ft. (575 Pa)**.
 - 1. Water Leakage: Uncontrolled water infiltrating the system or appearing on system's normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
- E. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:
 - 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure as indicated on Drawings.
 - 2. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/180 of the span.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory-, shop- and field-assembled work.
 1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):
 - a. Flashing and trim.
 - b. Anchorage systems.
- C. Samples for Initial Selection: For each type of metal wall panel indicated with factory-applied color finishes.
 1. Include similar Samples of trim and accessories involving color selection.
 2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 1. Metal **Wall** Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal wall panel accessories.
 2. Trim and Closures: 12 inches (305 mm) long. Include fasteners and other exposed accessories.
 3. Accessories: 12-inch- (305-mm-) long Samples for each type of accessory.
- E. Qualification Data: For Installer.
- F. Material Certificates: For thermal insulation, signed by manufacturers.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- H. Maintenance Data: For metal wall panels to include in maintenance manuals.
- I. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of metal wall panel from single source from single manufacturer.
- C. Preinstallation Conference: Conduct conference at Project site.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal wall panel assembly during and after installation.
8. Review wall panel observation and repair procedures after metal wall panel installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal wall panel for period of metal wall panel installation.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication, and indicate measurements on Shop Drawings.

1.8 COORDINATION

- A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of girts, studs, soffits, and other adjoining work to provide a leakproof, secure, and non-corrosive installation.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

- A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, **Class AZ50 coating designation, Grade 40** (Class AZM150 coating designation, **Grade 275**); structural quality.
 - 2. Surface: Smooth, flat finish.
 - 3. Exposed Coil-Coated Finish:
 - a. 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of **0.5 mil (0.013 mm)**.
- B. Panel Sealants:
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape **1/2 inch (13 mm)** wide and **1/8 inch (3 mm)** thick.
 - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.

3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.2 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, **G60 (Z180)** hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Hat-Shaped, Rigid Furring Channels:
1. Nominal Thickness: As required to meet performance requirements.
 2. Depth: **7/8 inch (22 mm)**.
- C. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.3 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.4 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.
- B. Flush-Profile, Concealed-Fastener Metal Wall Panels: Formed with vertical panel edges and flat pan between panel edges; with flush joint between panels.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alcoa Architectural Products (USA).
 - b. Architectural Metal Systems.
 - c. Architectural Innovative Metals.
 - d. ATAS International, Inc.
 - e. CENTRIA Architectural Systems.
 - f. Metal Sales Manufacturing Corporation.
 - g. Metecno-Morin.
 - h. Petersen Aluminum Corporation.
 - i. Taylor Metal Products.
 2. Material: Aluminum-zinc alloy-coated steel sheet, **0.028-inch (0.71-mm)** nominal thickness.
 - a. Exterior Finish: 2-coat fluoropolymer.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- b. Color: As selected by Architect from manufacturer's full range.
- 3. Panel Exposed Face Height: 12 inches (305 mm).
- 4. Panel Thickness: 1.0 inch (25 mm).

2.5 ACCESSORIES

- A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Formed from 0.018-inch (0.46-mm) minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.
- C. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- D. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.6 FABRICATION

- A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.
 - 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 3. Verify that air barrier has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
 4. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorages according to ASTM C 754 and metal wall panel manufacturer's written recommendations.
1. Soffit Framing: Wire-tie[or clip] furring channels to supports[, as required to comply with requirements for assemblies indicated].

3.3 THERMAL INSULATION INSTALLATION

- A. Board Insulation: Extend insulation in thickness indicated to cover entire wall. Comply with installation requirements in Division 7 Section "Building Insulation."
1. Erect insulation horizontally and hold in place with Z-shaped furring members spaced **24 inches (610 mm)** o.c. Attach furring members to substrate with screws spaced **24 inches (610 mm)** o.c.
 2. Retain insulation in place by metal clips and straps or integral pockets within panels, spaced at intervals according to insulation manufacturer's instructions. Maintain cavity width between insulation and metal liner panel of dimension indicated.

3.4 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Shim or otherwise plumb substrates receiving metal wall panels.
 2. Flash and seal metal wall panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal wall panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

7. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
 8. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 9. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners:
1. Steel Wall Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized steel fasteners for surfaces exposed to the interior.
 2. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized steel fasteners for surfaces exposed to the interior.
 3. Copper Wall Panels: Use copper, stainless-steel or hardware-bronze fasteners.
 4. Stainless-Steel Wall Panels: Use stainless-steel fasteners.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.
1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- E. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal wall panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 5. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
 6. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps; on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weathertight.
 7. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

- F. Zee Clips: Provide Zee clips of size indicated or, if not indicated, as required to act as standoff from subgirts for thickness of insulation indicated. Attach to subgirts with fasteners.

3.5 METAL SOFFIT PANEL INSTALLATION

- A. In addition to complying with requirements of “Metal Wall Panel Installation, General” Article, install metal soffit panels to comply with the requirements of this article.
- B. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
 - 1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

3.6 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's “Architectural Sheet Metal Manual.” Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of **10 feet (3 m)** with no joints allowed within **24 inches (605 mm)** of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with mastic sealant (concealed within joints).

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: **Owner will engage** a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by SEI/ASCE 7, but not less than **6.24 lbf/sq. ft. (300 Pa)**.
- C. Water-Spray Test: After completing the installation of **75-foot- (23-m-)** by-2-story minimum area of metal wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect and test completed metal wall panel installation, including accessories.
- E. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213

SECTION 074646 - FIBER-CEMENT PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes fiber-cement siding and soffit.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
 - 2. Section 062013 "Exterior Finish Carpentry" for exterior cellular PVC trim.
 - 3. Section 072500 "Weather Barriers" for weather-resistive barriers.

1.3 COORDINATION

- A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include manufacturer's current written installation instructions.
- B. Samples for Initial Selection: For fiber-cement **soffit** including related accessories.
- C. Samples for Verification:
 - 1. **12-inch-** (300-mm-) long-by-actual-width Sample of soffit.
 - 2. **12-inch-** (300-mm-) long-by-actual-width Samples of trim and accessories.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of fiber-cement.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.
- C. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.
- D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish full lengths of fiber-cement profiles, including related accessories, in a quantity equal to 2 percent of amount installed.

1.9 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Build mockups for fiber-cement profiles, including accessories.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with labels intact until time of use.
- B. Store materials on elevated platforms, under cover, and in a dry location.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including cracking and deforming.
 - b. Deterioration of materials beyond normal weathering.
 - 2. Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT SIDING

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]: [2/2010 edition 074600](#)

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

- a. Allura Fiber Cement Products by Plycem CGR <http://www.allurausa.com/>
- b. James Hardie.
- c. MaxiTile, Inc; a California corporation.
- d. Nichiha Fiber Cement.

- B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- C. Nominal Thickness: Not less than **5/16 inch (8 mm)**.
- D. Panel Texture: **48-inch- (1200-mm-)** wide sheets with smooth texture.
- E. Factory Priming: Manufacturer's standard acrylic primer.

2.3 FIBER-CEMENT SOFFIT

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
 - a. Allura Fiber Cement Products by Plycem <http://www.allurausa.com/>
 - b. James Hardie.
 - c. MaxiTile, Inc; a California corporation.
 - d. Nichiha Fiber Cement.
- B. Nominal Thickness: Not less than 1/4 inch.
- C. Factory Priming: Manufacturer's standard acrylic primer.

2.4 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.
- B. Flashing: Provide **stainless-steel** flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
- C. Fasteners:
1. For fastening to wood, use **ribbed bugle-head screws** of sufficient length to penetrate a minimum of **1 inch (25 mm)** into substrate.
 2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of **1/4 inch (6 mm)**, or three screw-threads, into substrate.
 3. For fastening fiber cement, use **stainless-steel** fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement profiles and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Do not install damaged components.
 - 2. Install fasteners no more than **24 inches (600 mm)** o.c.
- B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof curbs
 - 2. Roof hatches.
- B. Related Sections:
 - 1. Section 055000 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
 - 2. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing and miscellaneous sheet metal trim and accessories.
 - 3. Section 233423 "HVAC Power Ventilators" for power roof-mounted ventilators.

1.3 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories.
 - 1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.
- C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.
- D. Delegated-Design Submittal: For equipment supports and walkways indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 1. Size and location of roof accessories specified in this Section.
 2. Method of attaching roof accessories to roof or building structure.
 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 4. Required clearances.
- B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design roof curbs and equipment supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides and integrally formed deck-mounting flange at perimeter bottom.

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Curbs Plus, Inc.
- b. Custom Solution Roof and Metal Products.
- c. LM Curbs.
- d. Pate Company (The).
- e. Roof Products, Inc.
- f. Thybar Corporation.
- g. Vent Products Co., Inc.

- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Material: Zinc-coated (galvanized) steel sheet, [**0.052 inch (1.32 mm)**] thick.
1. Finish: Baked enamel or powder coat
 2. Color: As selected by Architect from manufacturer's full range.
- D. Construction:
1. Curb Profile: Manufacturer's standard compatible with roofing system.
 2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
 3. Fabricate curbs to minimum height of **12 inches (305 mm)** above roofing surface unless otherwise indicated.
 4. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange.
 5. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
 6. Insulation: Factory insulated with **1-1/2-inch- (38-mm-)** thick glass-fiber board insulation.
 7. Liner: Same material as curb, of manufacturer's standard thickness and finish.
 8. Nailer: Factory-installed wood nailer, continuous around curb perimeter.
 9. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
 10. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from **3/4-inch (19-mm)** thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
 11. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.3 ROOF HATCH

- A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides and integrally formed deck-mounting flange at perimeter bottom.
1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Babcock-Davis.
 - b. Bilco Company (The).
 - c. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
 - d. Nystrom.
 - e. Precision Ladders, LLC.
- B. Type and Size: Single-leaf lid, **30 by 36 inches (750 by 900 mm)**
- C. Loads: Minimum **40-lbf/sq. ft. (1.9-kPa)** external live load and **20-lbf/sq. ft. (0.95-kPa)** internal uplift load.
- D. Hatch Material: Zinc-coated (galvanized) steel sheet.
1. Thickness: Manufacturer's standard thickness for hatch size indicated.
 2. Finish: Baked enamel or powder coat.
 3. Color: As selected by Architect from manufacturer's full range.
- E. Construction:
1. Insulation: Glass-fiber board.
 - a. R-Value: 12.0 according to ASTM C 1363.
 2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
 3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
 4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
 5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
 6. Fabricate curbs to minimum height of **12 inches (305 mm)** above roofing surface unless otherwise indicated.
 7. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is constant. Equip hatch with water diverter or cricket on side that obstructs water flow.
- F. Hardware: Spring operators, hold-open arm, galvanized-steel spring latch with turn handles, galvanized-steel butt- or pintle-type hinge system, and padlock hasps inside and outside.

2.4 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, **G90 (Z275)** coating designation.
1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of **0.2 mil (0.005 mm)**.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 3. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.
 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of **0.5 mil (0.013 mm)**.
- B. Aluminum Sheet: **ASTM B 209 (ASTM B 209M)**, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
1. Mill Finish: As manufactured.
 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of **0.2 mil (0.005 mm)**.
 3. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 4. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of **0.5 mil (0.013 mm)**.
- C. Aluminum Extrusions and Tubes: **ASTM B 221 (ASTM B 221M)**, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.
- D. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.
- E. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.
- F. Steel Tube: ASTM A 500/A 500M, round tube.
- G. Galvanized-Steel Tube: ASTM A 500/A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.
- H. Steel Pipe: ASTM A 53/A 53M, galvanized.
- 2.5 MISCELLANEOUS MATERIALS
- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C), thickness as indicated.
- C. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.
- D. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPAC2; not less than 1-1/2 inches (38 mm) thick.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- F. Underlayment:
 - 1. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 - 2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
 - 3. Slip Sheet: Building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum, rosin sized.
 - 4. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 5. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - 6. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
 - 7. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 8. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- H. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- J. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof Curb Installation: Install each roof curb so top surface is level.
- D. Roof-Hatch Installation:
 - 1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 - 2. Attach safety railing system to roof-hatch curb.
 - 3. Attach ladder-assist post according to manufacturer's written instructions.
- E. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099100 "Painting."

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078100 - APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and Contract Documents apply to this Section.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.
 - 2. Review and finalize construction schedule and verify sequencing and coordination requirements.
 - 3. Review weather predictions, ambient conditions, and proposed temporary protections for SFRM and MIFRC during and after installation.
 - 4. Review surface conditions and preparations.
 - 5. Review field quality-control testing procedures.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals: Refer to Division 1 Section "Sustainable Design Requirements."
- C. Shop Drawings: Framing plans, schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - a. All design applications for this project are for unrestrained conditions unless explicitly stated otherwise in the documents for specific locations.
 - b. Fire-resistance design thicknesses for open web steel joists shall be based on testing at a maximum allowable stress of 30 ksi matching SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders."
 - 4. Treatment of fireproofing after application.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.
- D. Warranties: Sample form for special warranties specified in this Section.
- E. Inspection Report: Copies of SFRM system manufacturer's inspection report of completed SFRM installation, and of field inspection reports for startup and in-progress inspections.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.
- B. Inspection Reports of SFRM Manufacturer's Representative: SFRM manufacturer's representative shall inspect the work and provide copies of his inspection reports to the Architect and the Owner. The Installer shall notify manufacturer's representative of intended start date and schedule of roofing work.
 - 1. The Installer and SFRM manufacturer's representative shall inspect the substrate surfaces and applications to receive SFRM system prior to beginning installation.
 - 2. The SFRM manufacturer's representative shall inspect the work no less than three times (startup, in-progress, and end-of-installation warranty inspection) during the application of the system & submit copies of inspection reports to the Architect & Owner within 7 days of the inspection.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

1.7 COORDINATION

- A. Sequence and coordinate application of SFRM with other related work specified in other Sections to comply with the following requirements:
 - 1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
 - 2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
 - 3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.

1.8 WARRANTY

- A. Special Warranty: Installer's form in which installer agrees to repair or replace applied fireproofing that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of applied fireproofing from substrates.
 - b. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. VOC Content: Products shall comply with the following VOC limits 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. Primers, Sealers, and Undercoaters: 200 g/L.
 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
- E. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

- A. SFRM: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.
 1. Standard Density Cementitious Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carboline Company, subsidiary of RPM International; AD Southwest Fireproofing Type 5GP.
 - b. GCP Applied Technologies; Monokote MK-6 Series.
 - c. Isolatek International; Cafco 300.
 2. Application: Designated for exterior use by a qualified testing agency acceptable to authorities having jurisdiction.
 3. Bond Strength: Minimum 300-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.
 4. Density: As required for fire-resistance design indicated, according to ASTM E 605.
 5. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

6. Combustion Characteristics: Less than 5 MJ/m² total, 20 kw/m² peak heat release 20 kw/m² peak heat release according to ASTM E 1354.
7. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 10 or less.
 - b. Smoke-Developed Index: 10 or less.
8. Compressive Strength: Minimum 10 lbf/sq. in. according to ASTM E 761.
9. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
10. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
11. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
12. Air Erosion: Maximum weight loss of 0.005 g/sq. ft. in 24 hours according to ASTM E 859.
13. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21 or rating of 10 according to ASTM D 3274 when tested according to ASTM D 3273.
14. Finish: As selected by Architect from manufacturer's standard finishes.
 - a. Color of Topcoat (Exposed Applications): As selected by Architect from manufacturer's full range.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
 1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.
- C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.
- E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- G. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.
- H. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:
 - 1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Verify that concrete work on steel deck has been completed before beginning fireproofing work.
- C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work is complete before beginning fireproofing work.
- D. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of

fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
 - 3. Coat non-structural elements attached to rated structural members, including but not being limited to, CFSF members, clips, hangers, support sleeves, and similar items, with the same thickness of material applied to the rated structural members, for a distance of 2'-0" from the point of contact to the rated structural members.
- D. Metal Decks:
 - 1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, has been completed.
 - 2. Do not apply fireproofing to underside of metal roof deck until roofing has been completed; prohibit roof traffic during application and drying of fireproofing.
- E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- F. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- G. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- I. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.
- J. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- K. Cure fireproofing according to fireproofing manufacturer's written recommendations.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- L. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- M. Finishes: For exposed SFRM applications, apply fireproofing to produce the following finishes:
 - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the VUSBC.
 - 2. Testing Services: All spray-applied fireproofing shall be tested after installation according to ASTM E-605 and ASTM E-736, latest editions.
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078100

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals: Refer to Division 1 Section "Sustainable Design Requirements."
- C. Shop Drawings: Testing agency documents such as the UL Online Certifications Directory or the UL Fire Resistance Directory. Manufacturer's versions are not acceptable.
 - 1. Provide documentation on rigid support of the penetrating item if support methods are not indicated in the testing agency documents.
- D. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
 - 1. Where Project conditions would require modification of the designed or proposed firestopping system, research alternative systems from qualified testing agencies such as UL that may comply.
 - 2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, and no alternative systems can be found, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
 - 3. Modifications that are acceptable to the Architect will be forwarded to the authorities having jurisdiction under sealed cover stating that it is the A/E's opinion that the proposed engineering judgment complies with the VUSBC.
- E. Qualification Data: For qualified Installer.
- F. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibilities:
 - 1. Obtain firestop systems for each kind of firestop and construction condition indicated from a single primary firestop systems manufacturer.
 - 2. Provide primers and other secondary materials that are produced by or are specifically recommended by manufacturer of firestop materials to ensure compatibility of system.
 - 3. Materials of different manufacture than allowed by tested and listed system shall not be intermixed in same firestop system or opening.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."
- C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Penetration firestopping, including sleeves and surrounding materials, is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by UL in its "Fire Resistance Directory" or other agencies approved by authorities having jurisdiction.
- D. Preinstallation Conference: Conduct conference at Project site.
- E. Inspections of installed firestopping systems shall be in accordance with ASTM E 2174.

1.4 PROJECT CONDITIONS

- A. Inspection: Inspect sleeves and pre-made openings for compliance with assembly requirements. Do not proceed where sleeves or surroundings differ from tested or approved assemblies.
- B. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- C. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.5 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping. Field alterations of tested assemblies, including other sleeve materials, different penetrating items, differing annular spaces, and different sleeve lengths are not acceptable without prior approval by the authorities having jurisdiction.
- C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Hilti, Inc.
2. RectorSeal Corporation.
3. Specified Technologies Inc.
4. 3M Fire Protection Products.
5. Tremco, Inc.; Tremco Fire Protection Systems Group.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. Fire-resistance-rated walls include fire walls, fire-barrier walls, and fire partitions.
 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. Horizontal assemblies include floors, floor/ceiling assemblies, and roof/ceiling assemblies.
 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- F. Mold Resistance: Penetration firestopping with mold and mildew resistance rating of 0 as determined by ASTM G21.
- G. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

2.3 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide tested penetration firestop systems for all penetrations of fire-rated walls, partitions, floors, floor/ceiling assemblies, and ceiling assemblies. Where approved, provide firestop systems for unused "blank" penetration openings in lieu of patching.

3.2 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.4 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings as well as all written and graphic requirements in the test assembly documentation for products and applications indicated.
 - 1. Where method of support for the penetrating item is not addressed in the testing agency documentation, install rigid support per approved shop drawings.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.5 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.6 FIELD QUALITY CONTROL

- A. Owner will engage a qualified special inspector to conduct special inspections.
- B. Where deficiencies are found, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.7 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 078426 - THERMAL BARRIERS FOR PLASTICS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. SFRM: Sprayed fire-resistive material.
- B. Concealed: Fire-resistive materials applied to surfaces that are concealed from view behind other construction when the Work is completed.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: (Not applicable.)
- C. Product Certificates: For each type of thermal barrier, signed by product manufacturer.
- D. Qualification Data: For Installer, manufacturer and testing agency.
- E. Compatibility and Adhesion Test Reports: From thermal barrier manufacturer indicating the following:
 - 1. Materials have been tested for bond with substrates.
 - 2. Materials have been verified by thermal barrier manufacturer to be compatible with substrate primers and coatings.
 - 3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed thermal barrier.
- G. Research/Evaluation Reports: For thermal barrier.
- H. Warranties: Special warranties specified in this Section.
- I. Inspection Report: Copies of thermal barrier system manufacturer's inspection report of completed thermal barrier installation, and of field inspection reports for startup and in-progress inspections.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by thermal barrier manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its thermal barrier to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.
- B. Source Limitations: Obtain thermal barrier through one source from a single manufacturer.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Fire-Test-Response Characteristics: Provide thermal barrier with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing thermal barrier with appropriate markings of applicable testing and inspecting agency.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency acceptable to authorities having jurisdiction, for thermal barrier serving as direct-applied protection tested per ASTM E 119.
 - 2. Surface-Burning Characteristics: ASTM E 84.
 - D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to thermal barrier including, but not limited to, the following:
 - 1. Review products, exposure conditions, design ratings, restrained and unrestrained conditions, calculations, densities, thicknesses, bond strengths, and other performance requirements.
 - 2. Review and finalize construction schedule and verify sequencing and coordination requirements.
 - 3. Review weather predictions, ambient conditions, and proposed temporary protections for thermal barrier during and after installation.
 - 4. Review surface conditions and preparations.
 - 5. Review field quality-control testing procedures.
 - E. Inspection Reports of Thermal Barrier Manufacturer's Representative: thermal barrier manufacturer's representative shall inspect the work and provide copies of his inspection reports to the Architect and the Owner. The Installer shall notify manufacturer's representative of intended start date and schedule of roofing work.
 - 1. The Installer and thermal barrier manufacturer's representative shall inspect the substrate surfaces and applications to receive thermal barrier system prior to beginning installation.
 - 2. The thermal barrier manufacturer's representative shall inspect the work no less than three times (startup, in-progress, and end-of-installation warranty inspection) during the application of the system & submit copies of inspection reports to the Architect & Owner within 7 days of the inspection.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.
 - B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.
 - C. Store materials inside, under cover, and aboveground; keep dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply thermal barrier when ambient or substrate temperature is 40 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of thermal barrier. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.7 COORDINATION

- A. Sequence and coordinate application of thermal barrier with other related work specified in other Sections to comply with the following requirements:
 - 1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
 - 2. Provide temporary enclosures for applications to prevent deterioration of thermal barrier fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
 - 3. Avoid unnecessary exposure of thermal barrier fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
 - 4. Do not begin applying thermal barrier fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating thermal barrier fire protection are in place.
 - 5. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
 - 6. Do not install enclosing or concealing construction until after thermal barrier fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

PART 2 - PRODUCTS

2.1 THERMAL BARRIER MATERIALS

- A. Thermal Barrier for Cellular Foam Plastic: Provide material acceptable for plenum exposure, with flame-spread and smoke-developed indexes of not more than 25 and 50, respectively, per ASTM E 84, and that is a tested and approved thermal barrier for foam plastic in accordance with the applicable building code requirements for thermal barriers.
 - 1. Available Products: Provide one of the following or alternate complying material acceptable to Architect and LAHJ.
 - a. Cementitious SFRM Thermal Barrier for Cellular Foam:
 - 1) Grace, W. R. & Co.; Monokote Z-3306 series.
 - 2) Southwest Fireproofing Products Co., Inc.; 7TB Thermal Barrier.
 - b. Fire-Resistive, Water-Based, Intumescent Mastic Coating Material Thermal Barrier for Cellular Foam:
 - 1) Thermal Product Research (TPR2); Fireshell F10E.
 - 2) Flame Seal Products, Inc.; Flame Seal TB.
 - c. Cellulose SFRM Thermal Barrier for Cellular Foam

- 1) International Cellulose Corp.; Ure-K. (pending current ICC-ES)

2.2 AUXILIARY FIRE-RESISTIVE MATERIALS

- A. General: Provide auxiliary fire-resistive materials that are compatible with thermal barrier and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
 1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
 2. Substrates are free of dust or other contaminants capable of impairing bond of thermal barrier materials with foam plastic substrates.
 3. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying thermal barrier fire-resistive material.
- B. Verify that spray polyurethane foam air barrier, and other related work are completed prior to installation of thermal barrier for cellular foam plastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.
- B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.

3.3 APPLICATION, GENERAL

- A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- B. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by thermal barrier manufacturer, install body of fire-resistive covering in a single course.
- C. Spray-apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by thermal barrier manufacturer.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the VUSBC.
 - 2. Testing Services: All spray-applied fireproofing shall be tested after installation according to ASTM E-605 and ASTM E-736, latest editions. Mastics shall be tested in accordance with AWCI 12-B.
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIR

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect thermal barrier, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.
- C. Coordinate application of thermal barrier with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect thermal barrier and patch any damaged or removed areas.
- D. Repair or replace work that has not successfully protected steel.

END OF SECTION 078426

SECTION 078426 - THERMAL BARRIERS FOR PLASTICS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. SFRM: Sprayed fire-resistive material.
- B. Concealed: Fire-resistive materials applied to surfaces that are concealed from view behind other construction when the Work is completed.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: (Not applicable.)
- C. Product Certificates: For each type of thermal barrier, signed by product manufacturer.
- D. Qualification Data: For Installer, manufacturer and testing agency.
- E. Compatibility and Adhesion Test Reports: From thermal barrier manufacturer indicating the following:
 - 1. Materials have been tested for bond with substrates.
 - 2. Materials have been verified by thermal barrier manufacturer to be compatible with substrate primers and coatings.
 - 3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed thermal barrier.
- G. Research/Evaluation Reports: For thermal barrier.
- H. Warranties: Special warranties specified in this Section.
- I. Inspection Report: Copies of thermal barrier system manufacturer's inspection report of completed thermal barrier installation, and of field inspection reports for startup and in-progress inspections.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by thermal barrier manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its thermal barrier to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.
- B. Source Limitations: Obtain thermal barrier through one source from a single manufacturer.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Fire-Test-Response Characteristics: Provide thermal barrier with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing thermal barrier with appropriate markings of applicable testing and inspecting agency.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency acceptable to authorities having jurisdiction, for thermal barrier serving as direct-applied protection tested per ASTM E 119.
 - 2. Surface-Burning Characteristics: ASTM E 84.
 - D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to thermal barrier including, but not limited to, the following:
 - 1. Review products, exposure conditions, design ratings, restrained and unrestrained conditions, calculations, densities, thicknesses, bond strengths, and other performance requirements.
 - 2. Review and finalize construction schedule and verify sequencing and coordination requirements.
 - 3. Review weather predictions, ambient conditions, and proposed temporary protections for thermal barrier during and after installation.
 - 4. Review surface conditions and preparations.
 - 5. Review field quality-control testing procedures.
 - E. Inspection Reports of Thermal Barrier Manufacturer's Representative: thermal barrier manufacturer's representative shall inspect the work and provide copies of his inspection reports to the Architect and the Owner. The Installer shall notify manufacturer's representative of intended start date and schedule of roofing work.
 - 1. The Installer and thermal barrier manufacturer's representative shall inspect the substrate surfaces and applications to receive thermal barrier system prior to beginning installation.
 - 2. The thermal barrier manufacturer's representative shall inspect the work no less than three times (startup, in-progress, and end-of-installation warranty inspection) during the application of the system & submit copies of inspection reports to the Architect & Owner within 7 days of the inspection.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.
 - B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.
 - C. Store materials inside, under cover, and aboveground; keep dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply thermal barrier when ambient or substrate temperature is 40 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of thermal barrier. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.7 COORDINATION

- A. Sequence and coordinate application of thermal barrier with other related work specified in other Sections to comply with the following requirements:
 - 1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
 - 2. Provide temporary enclosures for applications to prevent deterioration of thermal barrier fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
 - 3. Avoid unnecessary exposure of thermal barrier fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
 - 4. Do not begin applying thermal barrier fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating thermal barrier fire protection are in place.
 - 5. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
 - 6. Do not install enclosing or concealing construction until after thermal barrier fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

PART 2 - PRODUCTS

2.1 THERMAL BARRIER MATERIALS

- A. Thermal Barrier for Cellular Foam Plastic: Provide material acceptable for plenum exposure, with flame-spread and smoke-developed indexes of not more than 25 and 50, respectively, per ASTM E 84, and that is a tested and approved thermal barrier for foam plastic in accordance with the applicable building code requirements for thermal barriers.
 - 1. Available Products: Provide one of the following or alternate complying material acceptable to Architect and LAHJ.
 - a. Cementitious SFRM Thermal Barrier for Cellular Foam:
 - 1) Grace, W. R. & Co.; Monokote Z-3306 series.
 - 2) Southwest Fireproofing Products Co., Inc.; 7TB Thermal Barrier.
 - b. Fire-Resistive, Water-Based, Intumescent Mastic Coating Material Thermal Barrier for Cellular Foam:
 - 1) Thermal Product Research (TPR2); Fireshell F10E.
 - 2) Flame Seal Products, Inc.; Flame Seal TB.
 - c. Cellulose SFRM Thermal Barrier for Cellular Foam

- 1) International Cellulose Corp.; Ure-K. (pending current ICC-ES)

2.2 AUXILIARY FIRE-RESISTIVE MATERIALS

- A. General: Provide auxiliary fire-resistive materials that are compatible with thermal barrier and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
 1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
 2. Substrates are free of dust or other contaminants capable of impairing bond of thermal barrier materials with foam plastic substrates.
 3. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying thermal barrier fire-resistive material.
- B. Verify that spray polyurethane foam air barrier, and other related work are completed prior to installation of thermal barrier for cellular foam plastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.
- B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.

3.3 APPLICATION, GENERAL

- A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- B. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by thermal barrier manufacturer, install body of fire-resistive covering in a single course.
- C. Spray-apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by thermal barrier manufacturer.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the VUSBC.
 - 2. Testing Services: All spray-applied fireproofing shall be tested after installation according to ASTM E-605 and ASTM E-736, latest editions. Mastics shall be tested in accordance with AWCI 12-B.
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIR

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect thermal barrier, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.
- C. Coordinate application of thermal barrier with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect thermal barrier and patch any damaged or removed areas.
- D. Repair or replace work that has not successfully protected steel.

END OF SECTION 078426

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals: Refer to Division 1 Section "Sustainable Design Requirements."
- C. Shop Drawings: Testing agency documents such as the UL Online Certifications Directory or the UL Fire Resistance Directory. Manufacturer's versions are not acceptable as a substitute, but may be included to clarify assembly options.
- D. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
 - 1. Where Project conditions would require modification of the designed or proposed firestopping system, research alternative systems from qualified testing agencies such as UL that may comply.
 - 2. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, and no alternative systems can be found, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
 - 3. Modifications that are acceptable to the Architect will be forwarded to the authorities having jurisdiction under sealed cover stating that it is the A/E's opinion that the proposed engineering judgment complies with the VUSBC.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibilities:
 - 1. Obtain firestop systems for each kind of firestop and construction condition indicated from a single primary firestop systems manufacturer.
 - 2. Provide primers and other secondary materials that are produced by or are specifically recommended by manufacturer of firestop materials to ensure compatibility of system.
 - 3. Materials of different manufacture than allowed by tested and listed system shall not be intermixed in same firestop system or opening.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."
- C. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
 - 1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
 - a. Fire-resistive joint system products bear classification marking of qualified testing agency.
 - b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by UL in its "Fire Resistance Directory."
- D. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
 - 1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies, and roofs or roof/ceiling assemblies.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hilti, Inc.
 - b. RectorSeal Corporation.
 - c. Specified Technologies Inc.
 - d. 3M Fire Protection Products.
 - e. Tremco, Inc.; Tremco Fire Protection Systems Group.
- C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. VOC Content: Provide fire-resistive joint systems that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- E. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings as well as all written and graphic requirements in the test assembly documentation for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified special inspector to conduct special inspections.
- B. Where deficiencies are found, repair or replace fire-resistive joint systems to comply with requirements.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.
- C. Provide joint sealants for interior STC-rated acoustical applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates, while maintaining indicated partition STC rating.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Sustainable Design Submittals: Refer to Division 1 Section "Sustainable Design Requirements."
- E. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- F. Qualification Data: For Installer and testing agency.
- G. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
- H. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- I. Field Test Report Log: For each elastomeric sealant application.
- J. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
- K. Warranties: Special warranties specified in this Section.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

L. Joint-Sealant Schedule: Include the following information:

1. Specification Section.
2. Joint-sealant joint location.
3. Joint-sealant joint type/designation.
4. Joint-sealant manufacturer.
5. Joint-sealant product name.
6. Joint-sealant formulation.
7. Joint-sealant primer, when required.
8. Joint-sealant backer rod type, when required.
9. Joint-sealant color.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.
1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
 3. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 2. Conduct field tests for each application indicated below:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 3. Notify Architect seven days in advance of dates and times when test joints will be erected. Architect's presence at testing is not required.
 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 5. Provide written report whether sealant in each type of joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- F. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
- G. Integrated Exterior Mockups: Attend preinstallation conference and provide joint sealant work for integrated exterior mockup as specified in Division 1 section "Quality Requirements."
- H. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Submittal Procedures:" article "Project Meetings." Review methods and procedures related to sealants at precast concrete.
- 1.5 PROJECT CONDITIONS
- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.6 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period - Silicone: 20 years from date of Substantial Completion.
 - 2. Warranty Period - Urethane: 5 years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

D. Low-Modulus Single-Component Neutral-Curing Silicone Sealant ES-1:

1. Products:
 - a. BASF; MasterSeal NP 100.
 - b. GE Silicones; SilPruf SCS2000.
 - c. Pecora Corporation; 864 or 890NST/890FTS for field-tint.
 - d. Polymeric Systems Inc.; PSI-641.
 - e. Tremco; Spectrem 3 or Spectrem 4TS for field-tint.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrate, O.
 - a. Use O Joint Substrates: aluminum coated with a high-performance coating, galvanized steel, brick.

E. Medium-Modulus Single-Component Neutral-Curing Silicone Sealant ES-2:

1. Products:
 - a. Dow Corning Corporation; 795
 - b. GE Silicones; SilPruf NB SCS9000.
 - c. Pecora Corporation; 895.
 - d. Tremco; Spectrem 2
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to **joint substrate**, O.
 - a. Use O Joint Substrates: aluminum coated with a high-performance coating, galvanized steel, brick and concrete.
6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.

F. Non-Traffic Multicomponent Nonsag Urethane Sealant ES-4:

1. Products:
 - a. BASF; MasterSeal NP 2.
 - b. Pecora Corporation; Dynatrol II.
 - c. Tremco; Dymeric 240 FC.
 - d. Schnee-Morehead, Inc.; Permthane SM 7200.
 - e. Sika Corporation, Inc.; Sikaflex - 2c NS TG.
 - f. Tremco; Vulkem 227.
2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25 minimum.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrate, O.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.4 LATEX JOINT SEALANTS

- A. Latex Sealant LS-1: Comply with ASTM C 834, Type P, Grade NF.
 - 1. Products:
 - a. BASF; MasterSeal NP 520.
 - b. Bostik Findley; Chem-Calk 600.
 - c. Pecora Corporation; AC-20+.
 - d. Schnee-Morehead, Inc.; SM 8200.
 - e. Tremco; Tremflex 834.

2.5 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Joint Sealant AS-1: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Accumetric LLC; BOSS 826 Acoustical Sound Sealant.
 - b. BASF; MasterSeal NP 520.
 - c. GE Construction Sealants; RCS20 Acoustical.
 - d. Grabber Construction Products; Acoustical Sealant GSC.
 - e. Hilti CP506 Smoke and Acoustical Sealant.
 - f. Pecora Corporation; AC-20 FTR or AIS-919.
 - g. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.

2.6 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bi-cellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 ACOUSTIC JOINT PACKING MATERIALS

- A. Mineral Wool Insulation:
 - 1. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. For use in sealing wall heads and around beam penetrations in concrete or concrete masonry unit walls, packed tight to no less than 8 pounds per cubic foot.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fibrex Insulations Inc.
 - b. Owens Corning.
 - c. Rockwool NA.
 - d. Thermafiber.

B. Elastomeric Closed Cell Neoprene Insulation:

1. Closed cell neoprene insulation of thickness to suit joint width.
2. Available Manufacturers:
 - a. AP Armaflex SS (Self Seal Insulation).
 - b. AP Armaflex II Sheet and Roll Insulation.
 - c. Aeroflex Aerocel.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Existing Exterior Masonry Movement Joint Material Replacement: Cut out existing sealant control and expansion joint material at exterior masonry; prepare joint substrate surfaces and provide new sealant joints as specified herein.
- B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile. (work of Division 9 Section "Tiling.")
 - d. Gypsum board. (work of Division 9)
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass. (work of Division 8 Section "Glazing.")
 - c. Porcelain enamel.
 - d. Glazed and glass surfaces of ceramic tile. (work of Division 9 Section "Tiling.")
 - e. Perimeter metal edge moldings of acoustical panel ceilings. (work of Division 9 "Acoustical Panel Ceilings")
- C. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- D. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- 3.3 INSTALLATION OF PACKING MATERIALS
- 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.
- 3.4 INSTALLATION OF JOINT SEALANTS
- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Provide sealant for all joints where sealant is not specified in other Sections. Seal all joints between dissimilar materials, unless indicated otherwise.
 2. For interior partitions indicated to be full height, seal all penetrations and joints unless indicated otherwise.
 3. Provide sealant on both sides of partitions unless indicated otherwise.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
1. For acoustic joints, comply with ASTM C919 – Standard Practice for Use of Sealants in Acoustical Applications
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.5 ACOUSTIC JOINTS AND PENETRATIONS

- A. Penetrations of Single-Wythe Masonry and Concrete Construction:
1. Ductwork:
 - a. Install a metal sleeve at the penetration. Size the sleeve to allow for 1-inch thick insulation and normal duct clearances. Line the sleeve with 1-inch thick elastomeric closed cell neoprene sheet insulation or mineral wool.
 - b. Install duct through lined sleeve and seal airtight with acoustical sealant.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- c. Do not rigidly secure pipe/conduit to wall with angles.
 - 2. Pipe/Conduit Diameter 1-Inch or Larger:
 - a. Install a metal sleeve at the penetration. Size the sleeve to allow for 1-inch thick insulation and normal pipe clearances. Line the sleeve with 1-inch thick elastomeric closed cell neoprene sheet insulation or mineral wool.
 - b. Install pipe/conduit through lined sleeve and seal airtight with acoustical sealant.
 - c. Do not rigidly secure pipe/conduit to wall with angles.
 - 3. Pipe/Conduit Diameter Less Than 1-Inch:
 - a. Wrap pipe/conduit with 1/2-inch thick elastomeric closed cell neoprene sheet insulation. Extend wrapping a minimum of 2-inches beyond the width of the partition on either side.
 - b. Grout tightly to the elastomeric insulation on the pipe/conduit.
 - c. Trim insulation to the width of the partition, and seal airtight with acoustical sealant.
- B. Penetrations of Single Stud Drywall Constructions:
 - 1. Ductwork:
 - a. Wrap duct with 1-inch thick elastomeric closed cell neoprene sheet insulation or mineral wool. Extend sheet insulation a minimum of 2-inches beyond the width of the partition on either side.
 - b. Install drywall tight to the sheet insulation.
 - c. Trim sheet insulation to the width of the partition, and seal airtight with acoustical sealant.
 - 2. Pipe/Conduit Diameter 1 Inch or Larger:
 - a. Wrap with 1/2-inch thick elastomeric closed cell neoprene sheet insulation. Extend wrapping a minimum of 2 inches beyond the width of the partition on either side.
 - b. Install a metal pipe sleeve around the insulation.
 - c. Install the drywall around the sleeve and spackle tightly to full thickness of partition.
 - d. Trim pipe insulation and sleeve to the width of the partition, and seal airtight with acoustical sealant.
 - 3. Pipe/Conduit Diameter Less Than 1 inch:
 - a. Wrap with 1/2-inch thick elastomeric closed cell neoprene sheet insulation. Extend wrapping a minimum of 2 inches beyond the width of the partition on either side.
 - b. Install the drywall around the sleeve and spackle tightly to full thickness of partition.
 - c. Trim pipe insulation and sleeve to the width of the partition, and seal airtight with acoustical sealant.
- C. Multiple Pipe/Conduit Penetrations:
 - 1. Where a series of conduits or pipes are penetrating the wall/floor/ceiling, each duct/conduit/pipe shall be separated by a minimum of 4 inches in all directions.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Penetrations of Double-Wythe Masonry/Concrete and/or Double Stud Drywall and/or Combination Construction:
1. Use same techniques described for single wythe and single stud assemblies, except do not bridge the separate studs or wythes with solid members such as sleeves or stud frames. Where sleeves are indicated, provide a separate sleeve for each wythe or stud.
- E. Intersection of Gypsum Board and Metal Deck:
1. Wall perpendicular or at a sharp angle to the metal deck ribs: Secure top channel of wall to deck. Pack the void between the ribs with mineral wool insulation so that it is tight and compact with no air or light gaps. Bring drywall up to within 1/2-inch following the profile of the deck, and fill gap with a continuous bead of acoustical sealant on backer rod.
 2. Wall parallel or at a shallow angle to the metal deck ribs: Secure 18 gauge sheet metal plate to the underside of the deck ribs, spanning the rib to where the top channel of the wall will attach if needed. Plate should span the full width of as many ribs as is necessary to be wider than the thickness of the wall construction. Alternatively, attach the top track to the metal deck flute. Pack the void between the metal deck and the plate/stud track mineral wool insulation so that it is tight and compact with no air or light gaps. Secure top channel of wall to steel plate and/or deck where applicable. Bring drywall up to within 1/2-inch the steel plate/metal deck and fill gap with a continuous bead of acoustical sealant.
- F. Intersection of Concrete or Masonry Block and Metal Deck:
1. Construct the wall up to within 3/4-inch of the deck. Pack the void between the ribs and joint at top of wall with mineral wool insulation so that it is tight and compact with no air or light gaps. Apply a continuous bead of acoustical sealant between bottom of deck and intersecting wall.
- G. Intersection of Gypsum Board Partition and Steel Beam:
1. Wall parallel or at a shallow angle to the metal deck ribs: As the wall intersects the beam, secure the top channel to the underside of the beam and fully around the beam forming out a box. Pack the void between the wall and the beam with mineral wool insulation so that it is tight and compact with no air or light gaps. Extend the gypsum board into the web of the beam so that it is within 1/2-inch of the beam vertical member. Apply a continuous bead of acoustical sealant between the gypsum board and the beam/fireproofing.
 2. Wall perpendicular or at a sharp angle to the metal deck ribs: Secure the top channel to the underside of the beam. Attach the drywall to the stud, stopping within 1/2-inch of the bottom of the beam. Run the drywall up past the beam, if it is possible, to within 1/2-inch of the deck above. Pack the space between the beam and the edge of the wall with mineral wool insulation. Insulation should be snug fit so that no device to hold the material in place is required. Apply a continuous bead of acoustical sealant between bottom flange of beam and insulation and the wall.
- H. Intersection of Concrete or Masonry Partition and Steel Beam:
1. Wall parallel or at a shallow angle to the metal deck ribs: Construct the wall so that it seals fully around the beam. Build the wall up to within 3/4-inch of the beam on all sides.

Pack mineral wool insulation between wall and beam on all sides. Apply a continuous bead of acoustical sealant between beam and intersecting wall.

2. Wall perpendicular or at a sharp angle to the metal deck ribs: Where possible, do not line up beams with CMU walls. Construct walls uninterrupted, full height and offset beams outside of walls. Where beam must intersect wall, build the wall up to within 3/4-inch of the bottom of the beam. Pack mineral wool insulation between wall and bottom of beam flange and between the wall and underside of the metal deck. Insert a 4-inch thick minimum, 100% solid CMU between the beam and the edge of the wall. Apply a continuous bead of acoustical sealant between bottom flange of beam and the edge of the exposed wall.

3.6 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
 - b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab in Appendix X1 in ASTM C 1193, as appropriate for type of joint-sealant application indicated.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
4. Inspect tested joints and report on the following:
 - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 - b. Whether sealants filled joint cavities and are free of voids.
 - c. Whether sealant dimensions and configurations meet specified requirements.
5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.7 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.8 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.9 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior vertical and horizontal non-traffic construction joints in cast-in-place concrete.
 - 1. Joint Sealant: Low Modulus Single-component neutral-curing silicone sealant ES-1.
- B. Joint-Sealant Application: Exterior vertical control and expansion joints in unit masonry.
 - 1. Joint Sealant: Low Modulus Single-component neutral-curing silicone sealant ES-1.
- C. Joint-Sealant Application: Exterior vertical joints between different materials listed above.
 - 1. Joint Sealant: Low Modulus Single-component neutral-curing silicone sealant ES-1.
- D. Joint-Sealant Application: Exterior perimeter joints between walls and frames of doors windows and louvers.
 - 1. Joint Sealant: Low or Medium Modulus Single-component neutral-curing silicone sealant ES-1 or ES-2.
- E. Joint-Sealant Application: Vertical control and expansion joints on exposed interior surfaces of exterior walls.
 - 1. Joint Sealant: Non-Traffic, Multi-component nonsag urethane sealant ES-4.
- F. Joint-Sealant Application: Interior perimeter joints of exterior openings.
 - 1. Joint Sealant: Non-Traffic, Multi-component nonsag urethane sealant ES-4.
- G. Joint-Sealant Application: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
 - 1. Joint Sealant: Single-component mildew-resistant neutral or acid-curing silicone sealant ES-3.
- H. Joint-Sealant Application: Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - 1. Joint Sealant: Non-traffic multi-component nonsag urethane sealant ES-4.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- I. Joint-Sealant Application: Vertical and perimeter joints on concealed surfaces of interior unit masonry, concrete, and panel full-height walls and partitions. Refer to other Division 9 Sections for acoustical sealant included as part of assembly installations.
 - 1. Joint Sealant: Acoustical joint sealant AS-1.
- J. Joint-Sealant Application: Vertical and perimeter joints on exposed and concealed surfaces of interior unit masonry, concrete, and panel acoustic STC-rated walls and partitions. Refer to other Division 9 Sections for acoustical sealant included as part of assembly installations.
 - 1. Joint Sealant: Acoustical joint sealant AS-1.
- K. Joint-Sealant Application: Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
 - 1. Joint Sealant: Latex sealant LS-1.

END OF SECTION 079200

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 081113 - STEEL FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to SDI A250.8.
- B. Standard Steel Door and Frame Work: Steel door and frame work fabricated according to ANSI/SDI A250.8.
- C. Undercut: Clearance between bottom of door and top of finish floor or threshold below the door.

1.3 COORDINATION

- A. Coordinate anchorage installation for steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions and finishes.
- B. Shop Drawings: Include the following:
 - 1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 2. Locations of reinforcement and preparations for hardware
 - 3. Details of each different wall opening condition.
 - 4. Details of anchorages, joints, field splices, and connections.
 - 5. Details of accessories.
 - 6. Details of moldings, removable stops, and glazing.
- C. Samples for Verification:
 - 1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 127 mm).
 - 2. Fabrication: Prepare Samples approximately [12 by 12 inches (305 by 305 mm)] [8 by 10 inches (203 by 254 mm)] to demonstrate compliance with requirements for quality of materials and construction:
 - a. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed steel panels and glazing if applicable.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Product Schedule: For steel frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of steel door and frame assembly, for tests performed by a qualified testing agency. ***FIRE RATED ONLY**

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver steel frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store steel frames vertically under cover at Project site with heads up. Place in stacks of five units maximum, spaced by blocking. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Do not store in a manner that traps excess humidity.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain steel frames from single source from single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Ceco Door Products; an Assa Abloy Group company.
 - 2. Curries Company; an Assa Abloy Group company.
 - 3. Fleming Door Products Ltd.; an Assa Abloy Group company.
 - 4. MPI Group, LLC. (Metal Products, Inc.)
 - 5. Pioneer Industries, Inc.
 - 6. Steelcraft; an Ingersoll-Rand company.
 - 7. Windsor Republic Doors.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Per NFPA 80, fire exit doors shall be labeled "Fire Door to Be Equipped with Fire Exit Hardware," and shall be reinforced and constructed to maintain the rating of the specific listed and labeled fire exit devices mounted on them.
 - 2. For fire doors bearing the Smoke and Draft Control Door "S" marking, provide UL Classified Category H gasketing materials.
 - 3. Smoke- and Draft-Control Assemblies: Provide assemblies with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

- B. Thermally Rated Door Assemblies (Exterior Doors): Provide operable door assemblies with U-factor of not more than 0.38 deg Btu/F x h x sq. ft. when tested according to ASTM C 1363.

2.3 STANDARD STEEL FRAMES, GENERAL

- A. Construct steel frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. General: Provide frames of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 - 1. Core Construction: Manufacturer's standard polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel stiffener core. Kraft paper honeycomb core is not acceptable.
 - 2. Fire-Rated Core: Manufacturer's standard, as required to provide fire-protection and temperature-rise ratings indicated.
 - 3. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
 - 4. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
 - 5. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 INTERIOR STANDARD STEEL FRAMES

- A. Interior Frames: Fabricated from cold-rolled steel sheet or metallic-coated sheet. Comply with ANSI/SDI A250.8 and with details indicated for frame type and profile.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as face welded unless otherwise indicated.
 - 3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions. Frames: ~~0.053-inch~~ (1.3-mm-) thick steel sheet.
 - 4. Frames for Wood Doors: ~~0.053-inch~~ (1.3-mm-) thick steel sheet.
 - 5. Frames for Borrowed Lights: ~~0.053-inch~~ (1.3-mm-) thick steel sheet.

2.5 EXTERIOR STANDARD STEEL FRAMES

- A. Exterior Frames: Fabricated from metallic-coated steel sheet. Comply with ANSI/SDI A250.8 and with details indicated for frame type and profile.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as face welded unless otherwise indicated.
 - 3. Frames for Level 3 Steel Doors: ~~0.053-inch~~ (1.3-mm-) thick steel sheet.

2.6 BORROWED LITES

- A. Fabricate of cold rolled or metallic-coated steel sheet, minimum thickness of 0.053 inch.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Construction: Face welded, unless otherwise indicated.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.7 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - 2. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042-inch-thick, with corrugated or perforated straps not less than 2-inches-wide by 10 inches long; or wire anchors not less than 0.177-inch-thick.
 - a. Provide “offset” masonry “T” anchors for applications at cavity wall construction only. Basis-of-Design Product: Gulfport Industries Inc. #FR 673 with 45-degree offset strap anchor.
 - 3. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042-inch-thick.
 - 4. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
 - 5. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

2.8 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011; hot-dip galvanized according to ASTM A 153, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching steel frames of type indicated.
- G. Grout: ASTM C 476 and maximum slump of 4 inches, as measured according to ASTM C 143.
- H. Glazing: Comply with requirements in Section 088000 "Glazing."

2.9 FABRICATION

- A. Steel Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - 2. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
 - 3. Coordinate with square steel tube removable mullion furnished as exit device accessory under Division 08 Section "Door Hardware."
 - 4. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 5. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- B. Hardware Preparation: Factory prepare steel frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 3. Comply with BHMA A156.115 for preparing steel doors and frames for hardware.

2.10 STEEL FINISHES

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

2.11 LOUVERS

- A. Transom Louvers: Provide sight-proof stationary louvers for exterior transom applications, where indicated, with inverted V-shaped or Y-shaped blades (60% free area) formed of hot-dip galvanized 0.032-inch-thick (20 gage), cold-rolled steel sheet for stop-set installation. Provide louver manufacturer's standard aluminum or galvanized steel [insect] [bird] screen furnished

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

loose for installation after field painting. Basis-of-Design Product is Anemostat "CHDL" louver.

- B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. General: Install steel frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Steel Frames: Comply with SDI A250.11.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 2. Fire-Rated Openings: Install fire door assemblies per NFPA 80, the door and frame manufacturers' installation instructions, and manufacturers' listing requirements.
 - 3. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 4. Solidly pack mineral-fiber insulation inside frames.
 - 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 - 6. Installation Tolerances: Adjust steel frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
- d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in Division 9 Section "Painting."

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Undercut: Clearance between bottom of door and top of finish floor or threshold below the door.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Sustainable Design Submittals: Refer to Division 1 Section "Sustainable Design Requirements."
- C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. Dimensions and locations of blocking.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Undercuts.
 - 5. Requirements for veneer matching.
 - 6. Doors to be factory finished and finish requirements.
 - 7. Fire-protection ratings for fire-rated doors.
- D. Samples for Initial Selection: For factory-finished doors.
- E. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
 - 2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each species of veneer and solid lumber required.
 - b. Provide Samples for each color, texture, and pattern of plastic laminate required.
 - c. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
 - 3. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body and is a certified participant in AWI's Quality Certification Program.
- B. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Except where exposed to view, mark each door on top rail with opening number used on Shop Drawings. Mark doors on bottom rail where top of door will be exposed to view.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4-inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by **one of** the following:
 - 1. Marshfield-Algoma by Masonite Architectural. BOD – Signature Series
 - 2. Eggers Industries.
 - 3. Lambton Doors.
 - 4. VT Industries, Inc.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Doors shall be manufactured by hot-press method, bonding faces, crossbands, and core together in a single operation with Type I glue. Doors manufactured by cold-pressing 2 or 3 ply pre-manufactured door skins to multiple cores in the same press will not be accepted.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
1. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard. mfr
- B. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that contain no added urea formaldehyde or ultra-low-emitting formaldehyde (NAUF/ULEF).
- C. Fire-Rated Wood Doors: Doors 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. After 5 minutes into the NFPA 252 test, the neutral pressure level in the furnace shall be established at 40 inches or less above the sill.
1. Per NFPA 80, fire exit doors shall be labeled "Fire Door to be Equipped with Fire Exit Hardware," and shall be reinforced and constructed to maintain the rating of the specific listed and labeled fire exit devices mounted on them.
 2. For fire doors bearing the Smoke and Draft Control Door "S" marking, provide UL Classified Category H gasketing materials.
 3. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 4. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 5. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges. (UL Category A.)
 6. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- D. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- E. Particleboard-Core Doors:
1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde or ultra-low-emitting formaldehyde (NAUF/ULEF).
 2. Provide doors with glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices and doors indicated to receive surface-mounted closers.
- F. Structural-Composite-Lumber-Core Doors:
1. Structural Composite Lumber: WDMA I.S.10.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- a. Screw Withdrawal, Face: 700 lbf (3100 N).
- b. Screw Withdrawal, Edge: 400 lbf (1780 N).

G. Mineral-Core Doors:

- 1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
- 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
- 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

H. Door Weight: Weight of any door leaf without hardware shall not exceed 200 pounds unless approved by the Architect.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

- 1. Grade: Custom (Grade A faces).
- 2. Species: Match existing species
- 3. Finish: Transparent Stain to match existing
- 4. Cut: Plain sliced (flat sliced).
- 5. Match between Veneer Leaves: Book match.
- 6. Assembly of Veneer Leaves on Door Faces: Running match.
- 7. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
- 8. Veneers for all doors in the Work well-matched for color and grain as approved.
- 9. Side Panel Match: Continuous match.
- 10. Exposed Vertical and Top Edges: Same species as faces or a compatible species - edge Type A.
- 11. Core: Particleboard or structural composite lumber.
- 12. Provide manufacturer's SLC construction doors with glazing area cut-out for 9-inch stile width doors.
- 13. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
- 1. Wood Species: Same species as door faces.
 - 2. Profile: Flush rectangular beads.
 - 3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 1. Non-Fire-Rated Wood Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Bumper or Panic Threshold (not including the stop strip): Maximum 3/16 inch.
 - e. Between Bottom of Door and Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
 - 1. Fabricate side panels with full-width, solid-lumber meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Factory cut and trim openings through doors.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 8 Section "Glazing."

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises unless indicated otherwise.
 - a. Finish top edges of doors exposed to view from above, such as in stairwells, multi-story spaces, and low doors and gates.
- B. Factory finish doors that are indicated to receive transparent finish.
- C. Transparent Finish:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Grade: Custom.
2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 5, conversion varnish or System 11, catalyzed polyurethane.
3. Staining: Match Architect's sample.
4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 1. Install fire door assemblies per NFPA 80, the door and frame manufacturers' installation instructions, and manufacturers' listing requirements.
 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge. Adjust installed clearances to meet factory fitting requirements indicated for fabrication. Replace doors that do not meet clearance requirements.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 081613 – FIBERGLASS REINFORCED POLYESTER (FRP) FLUSH DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.
- B. Air Infiltration: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 283 at pressure differential of 6.24 psf. Door shall not exceed 0.90 cfm per linear foot of perimeter crack.
- C. Water Resistance: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 331 at pressure differential of 7.50 psf. Door shall not have water leakage.
- D. Hurricane Test Standards, Single Door with Single-Point Latching:
1. Uniform Static Load, ASTM E 330: Plus or minus 75 pounds per square foot.
 2. Forced Entry Test, 300-Pound Load Applied, SFBC 3603.2 (b)(5): Passed.
 3. Cyclic Load Test, SFBC PA 203: Plus or minus 53 pounds per square foot.
 4. Large Missile Impact Test, SFBC PA 201: Passed.
- E. Swinging Door Cycle Test, Doors and Frames, ANSI A250.4: Minimum of 12,000,000 cycles.
- F. Thermal Transmission, Exterior Doors, U-Value, AAMA 1503.1: Maximum of 0.09 BTU/hr x sf x degrees F.
- G. Surface Burning Characteristics, FRP Doors and Panels, ASTM E 84:
1. Flame Spread: Maximum of 200, Class C.
 2. Smoke Developed: Maximum of 450, Class C.
- H. Surface Burning Characteristics, Class A Option On Interior Faces of FRP Exterior Panels and Both Faces of FRP Interior Panels, ASTM E 84:
1. Flame Spread: Maximum of 25.
 2. Smoke Developed: Maximum of 450.
- I. Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 256: 15.0 foot-pounds per inch of notch.
- J. Indentation Hardness, FRP Doors and Panels, Nominal Value, ASTM D 2583: 55.
- K. Abrasion Resistance, Face Sheet, Taber Abrasion Test, 25 Cycles at 1,000 Gram Weight with CS-17 Wheel: Maximum of 0.029 average weight loss percentage.
- L. Stain Resistance, ASTM D 1308: Face sheet unaffected after exposure to red cabbage, tea, and tomato acid. Stain removed easily with mild abrasive or FRP cleaner when exposed to Sharpie ink pen and white spray paint.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

M. Chemical Resistance: ASTM D 543. Excellent rating.

1. Acetic acid, 5 percent solution.
2. Chlorine bleach, 10 percent solution.
3. Sodium hypochlorite, 4 to 6 percent solution.
4. Citric acid, 10 percent solution.
5. Sodium carbonate, 20 percent solution.
6. Turpentine.

1.3 SUBMITTALS

- A. Coordination: Provide submittal for work of this section concurrently with submittal for Section 084113 and coordinate components and installation for project applications.
- B. Product Data: Submit manufacturer's product data, including description of materials, components, fabrication, finishes, and installation.
- C. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
- D. Samples:
1. Door: Submit sample of door showing face sheets, core, framing, and finish.
 2. Color: Submit manufacturer's samples of standard colors of doors and frames.
- E. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
- F. Manufacturer's Project References: Submit list of successfully completed projects including project name and location, name of architect, and type and quantity of doors manufactured.
- G. Maintenance Manual: Submit manufacturer's maintenance and cleaning instructions for doors, including maintenance and operating instructions for hardware.
- H. Warranties: Special warranties specified in this Section.
- I. Sustainable Design Submittals: Refer to Division 1 Section "Sustainable Design Requirements."

PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations and dimensions for FRP doors by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating FRP doors without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver FRP doors cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish
- B. Inspect FRP doors on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.
- C. Store FRP doors at building site under cover, in accordance with manufacturer's instructions.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.6 WARRANTY

- A. Provide a written parts and labor warranty signed by manufacturer, installer and contractor, agreeing to replace, at no cost to the Owner, any doors, frames or factory hardware installation which fail in materials or workmanship, within the warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Deterioration of finishes, and other materials beyond normal weathering.
 - c. Failure of operating components to function properly.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Product: The design for aluminum-framed systems is based on Special-Lite "SL-17 SpecLite FRP Door." Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. Vale FRP Doors www.valedoors.com
 - 2. Commercial Door Systems www.commercialdoorsystems.com
 - 3. Kawneer Co. "Flushline" www.kawneer.com

2.2 MATERIALS AND ACCESSORIES

- A. Aluminum Members: Alloy and temper as recommended by manufacturer for strength, corrosion resistance and application of required finish and control of color; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate with aluminum wall thickness of 0.125"
- B. Fasteners: Aluminum, non-magnetic stainless steel or other non-corrosive metal fasteners, guaranteed by the manufacturer to be compatible with the doors, frames, stops, panels, hardware, anchors and other items being fastened. For exposed fasteners (if any) provide Phillips head screws with finish matching the item to be fastened.
- C. Glazing gaskets: For glazing factory-installed glass, and for gaskets which are factory-installed in "captive" assembly of glazing stops, manufacturer's standard stripping of molded neoprene, complying with ASTM D2000 (designation 2BC415 to 3BC620), or molded PVC complying with ASTM C 509 Grade 4.

2.3 FIBERGLASS REINFORCED POLYESTER (FRP) FLUSH DOORS

- A. Doors: Flush FRP doors, for manual swing operation.
- B. Door Opening Size: As indicated on Drawings.
- C. Construction:
 - 1. Door Thickness: 1-3/4 inches.
 - 2. Stiles and Rails: Aluminum Alloy 6063-T5, minimum of 2-5/16-inch depth.
 - 3. Corners: Mitered.
 - 4. Provide joinery of 3/8-inch diameter full-width tie rods through extruded splines top and bottom as standard tubular shaped stiles and rails reinforced for hardware specified.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

5. Securing Internal Door Extrusions: 3/16-inch angle blocks and locking hex nuts for joinery. Welds, glue, or other methods are not acceptable.
6. Furnish extruded stiles and rails with integral reglets to accept face sheets. Lock face sheets into place to permit flush appearance.
7. Rail caps or other face sheet capture methods are not acceptable.
8. Extrude top and bottom rail legs for interlocking continuous weather bar.
9. Meeting Stiles: Pile brush weatherseals. Extrude meeting stile to include integral pocket to accept pile brush weatherseals.
10. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.

D. Face Sheet:

1. Material: Fiberglass-reinforced plastic, 0.120-inch thickness, finish color throughout. Abuse-resistant engineered surface.
2. Texture: Pebble.
3. Color: As selected from manufacturer's standards.

E. Core:

1. Material: Poured-in-place polyurethane foam.
 - a. Density: Minimum of 5 pounds per cubic foot.
 - b. R-Value: Minimum of 11

F. Cutouts:

1. Manufacture doors with cutouts for required vision lites, louvers, and panels.
2. Factory-install vision lites, louvers, and panels.

G. Door Hardware: As specified in Division 8 Section "Door Hardware."

1. Premachine doors in accordance with templates from Division 8 door hardware supplier.
2. Factory-install hardware.

2.4 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."

2.5 HARDWARE

- A. Pre-machine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
- B. Factory-install hardware.
- C. Hardware Schedule: As specified in Division 08 Section "Door Hardware."

2.6 VISION LITES

- A. Factory Glazing: 1-inch glass insulating units.
- B. Lites in Exterior Doors: Allow for thermal expansion.
- C. Rectangular Lites:
1. Size: As indicated on the Drawings.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Factory glaze with screw-applied aluminum stops anodized to match perimeter door rails.

2.7 FABRICATION

- A. Sizes and Profiles: The required sizes for door and frame units, and profile requirements are shown on the drawings.
- B. Coordination of Fabrication: Field measure before fabrication, and show recorded measurements on final shop drawings.
- C. Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to assembly. Remove burrs from cut edges, and ease edges and corners to a radius of approximately 1/64".
- D. No welding of doors or frames is acceptable.
- E. Maintain continuity of line and accurate relation of planes and angles. Secure attachments and support at mechanical joints, with hairline fit at contacting members.
- F. Prefabrication: All hardware, with the exception of door closer, threshold, weatherstripping, to be shipped to door manufacturer, by the FRP door distributor. Door manufacturer shall install hardware on doors. Complete fabrication, assembly, finishing and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.

2.8 ALUMINUM FINISHES

- B. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.2 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Anchor frames securely in place.
- D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.
- E. Set thresholds in bed of mastic and backseal.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- F. Install exterior doors to be weathertight in closed position.
- G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- H. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.3 ADJUSTING

- A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.

3.4 CLEANING AND PROTECTION

- A. Clean doors promptly after installation in accordance with manufacturer's instructions. Do not use harsh cleaning materials or methods that would damage finish.
- B. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 081613

SECTION 084000 - ALUMINUM STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Provisions of the Contract and of the Contract Documents apply to this Section.
- B. Section 08 8000 – Glazing
- C. Section 08 1416 – Flush Wood Doors

1.2 ACTION SUBMITTALS

- A. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Indicate anchorage of aluminum-framed systems to surrounding construction to transfer loads to structure.
 - 2. Shop drawings must be produced by or approved by the applicable aluminum entrance, storefront manufacturer.
- B. Samples for Initial Selection: For units with factory-applied color finishes, manufacturer's printed color selection data.
 - 1. Submit separate color selection data for framing systems and coil-coated sheet products where they do not match.
- C. Color Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
 - 1. Submit two samples.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and professional engineer.
- B. Product Test Reports: Certified test results showing that systems have been tested by a recognized testing laboratory or agency and comply with performance characteristics.
- C. Source quality-control reports.
- D. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For glazed aluminum-framed entrances, storefronts, and curtain walls to include in maintenance manuals.

1.5 QUALITY ASSURANCE:

- A. Source Limitations: Obtain aluminum storefront through one source from a single manufacturer.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Installer's Qualifications: Firm with a record of successful installations of storefront, curtain wall, and entrances similar in scope to this project, capable of assuming engineering responsibility, and employs installers and supervisors who are trained and approved by manufacturer.
 - 1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
- D. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code-Aluminum."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Check openings by field measurement before fabrication to ensure proper fitting of work; show field measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in the work. Coordinate fabrication tolerances to ensure proper fit. Coordinate and allow for sealant joints and steel lintels.

1.7 WARRANTY

- A. General: Warranties indicated in this Section shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties under requirements of the Contract Documents.
- B. Special Assembly Warranty: Manufacturer agrees to repair or replace components of storefront that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by structural movements.
 - c. Deterioration of metals and other materials beyond normal wear.
 - 2. Warranty Period: Two (2) years from date of Substantial Completion.
- C. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazed aluminum curtain walls.
- B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum-framed systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Aluminum-framed storefronts shall withstand movements of supporting structure including, but not limited to deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Movement and thermal stresses transferring to glazing.
 - d. Glass breakage.
 - e. Noise or vibration created by structural movements.
 - f. Loosening or weakening of fasteners, attachments, and other components.
 - g. Sealant failure.
- C. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:
 - 1. Sound Transmission Class (STC): Minimum 35 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- D. Recycled Content: Provide products with a minimum post-consumer recycled content of 50%.
- E. Sealants and sealant primers shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168 VOC limits.
 - 1. Architectural Sealants: 250 g/L or less.
 - 2. Other Sealants: 420 g/L or less.
 - 3. Architectural sealant primers (nonporous): 250 g/L or less.
 - 4. Architectural sealant primers (porous): 775 g/L or less.
 - 5. Other sealant primers: 750 g/L or less.

2.2 MANUFACTURERS:

- A. Detailing for interior aluminum entrances, storefront is based on the following systems. Contractor shall coordinate all adjustments, if any, required for provided products as approved by the Architect.
 - 1. Interior Storefront System: EFCO 401 (NT)

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

B. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. Interior Storefront: 2 x 4.5 inch center-set framing:
 - a. EFCO "433 (T)."
 - b. Kawneer "451T."
 - c. Oldcastle "3000 Thermal."
 - d. YKK AP "YES 45 TU."
2. Entrances: Heavy duty 2 inch, wide stile:
 - a. EFCO "D518 Durastile."
 - b. Kawneer "500 Heavy Wall."
 - c. Oldcastle "Rugged Entrance."
 - d. YKK AP "50M."

2.3 STOREFRONT FRAMING, GENERAL

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Single thermal break (exterior)
 - a. For 1/4-inch glazed frames, provide extrusions fabricated specifically for 1/4-inch glazing. Units with adapters for 1-inch glazing pockets are not acceptable.
 2. Glazing System: [Retained mechanically with gaskets on four sides] [Retained mechanically with gaskets on two sides and structural sealant on two sides].
 3. Glazing Plane: Center.
 4. Finish: Clear anodic finish .
 5. Fabrication Method: Field-fabricated stick system.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Enhanced Sill Flashing System: Provide thermally-broken extruded aluminum sill flashing with 2-inch tall back leg and bottom profile with outboard trough and weep holes to direct water to exterior. Provide full-frame-depth end dams mechanically attached to sill flashing extrusion and sealed with silicone. Provide silicone sill flashing splice sleeves and sealant as required at end dams and penetrations for anchorage. Provide finish to match framing.
- E. Offset Anchorage System: Provide frame anchorage incorporating offset anchors and finished extruded cover trim matching storefront framing. Anchorage "clip and cover" system shall be engineered by storefront manufacturer.
- F. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: **ASTM B 209** (**ASTM B 209M**).

- b. Extruded Bars, Rods, Profiles, and Tubes: **ASTM B 221 (ASTM B 221M)**.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
- a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
- 1. Door Construction: **2-inch (50.8-mm)** overall thickness, with minimum **0.188-inch (4.8-mm-)** [**2- to 2-1/4-inch (50.8- to 57.2-mm)**] thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior
 - 2. Door Design: Wide stile; **5-inch (127-mm)** nominal width
 - 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

- A. General: Provide entrance door hardware[and entrance door hardware sets indicated in door and frame schedule][and entrance door hardware sets indicated in "Entrance Door Hardware Sets" Article] for each entrance door to comply with requirements in this Section.
- 1. Entrance Door Hardware Sets: products complying with BHMA standard referenced.
 - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
 - 3. Opening-Force Requirements:
 - a. Egress Doors: Not more than **15 lbf (67 N)** to release the latch and not more than **30 lbf (133 N)** to set the door in motion
 - b. Accessible Interior Doors: Not more than **5 lbf (22.2 N)** to fully open door.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:
- 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.
- C. Continuous-Gear Hinges: Manufacturer's standard with stainless-steel bearings between knuckles, fabricated to full height of door and frame.
- D. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.
- E. Manual Flush Bolts: BHMA A156.16, Grade 1.
- F. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- G. Cylinders: BHMA A156.5, Grade 1.
 1. Keying: to be furnished by Owner.
- H. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- I. Operating Trim: BHMA A156.6.
- J. Removable Mullions: BHMA A156.3, extruded aluminum.
 1. When used with panic exit devices, provide removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305. Use only mullions that have been tested with exit devices to be used.
- K. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.
- L. Concealed Overhead Holders: BHMA A156.8, Grade 1.
- M. Surface-Mounted Holders: BHMA A156.16, Grade 1.
- N. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- O. Weather Stripping: Manufacturer's standard replaceable components.
 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
- P. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- Q. Silencers: BHMA A156.16, Grade 1.
- R. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (12.7 mm).
- S. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.6 GLAZING

- A. Glazing: Comply with Division 8 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.
 - 1. Color: Black.
- D. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
 - 1. Color: Match structural sealant.

2.7 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials or dead-soft, 0.018-inch- thick stainless steel, ASTM A 240 of type recommended by manufacturer.

2.8 FABRICATION

- A. Except where coil-coated sheet material is indicated, form aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Reinforcing: Install reinforcing as required for performance requirements, sag resistance and rigidity.
- D. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying manufacturer's recommended sealant or tape.
- E. Fabricate components that, when assembled, have the following characteristics:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Physical and thermal isolation of glazing from framing members.
 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 5. Provisions for field replacement of glazing.
 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- F. Fabricate components to resist water penetration.
- G. Framing, General: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system.
1. Provide closed back (or flat filler) extruded jamb section for all door jamb installations to masonry. Open back sections are not acceptable for these applications. Provide concealed anchorage for jamb extrusions.
 2. Glass is specified in Division 08 Section "Glazing."
 3. Subframes: Provide subframes with anchors for window units, not less than 0.062-inch-thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Match color and finish of primary framing members.
 4. Built-up Corner Closures and Sill Base: Provide aluminum closure pieces of profiles and dimensions indicated, finished to match other exposed components. Provide outside-corner profiles of not less than 0.062-inch-thick extruded aluminum and base sill closure pieces of not less than 0.080-inch-thick extruded or sheet aluminum.
 5. Perform fabrication operations, including cutting, fitting, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Do not drill and tap for hardware items until time of installation at project site.
- H. Curtain-Wall Framing: Factory-assemble components to greatest extent possible.
- I. Factory-Assembled Frame Units:
1. Rigidly secure nonmovement joints.
 2. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion.
 3. Preparation includes, but is not limited to, cleaning and priming surfaces.
 4. Seal joints watertight unless otherwise indicated.
- J. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.
- K. Fasteners: Conceal fasteners.
- L. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings. Disassemble components only as necessary for shipment and installation.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.9 ALUMINUM FINISHES

Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
- B. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible
- C. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum is in contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install glazing as specified in Division 08 Section "Glazing."

3.3 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure installed storefront, entrance and curtain wall system work is without damage or deterioration at the time of Substantial Completion.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

END OF SECTION 084000

SECTION 087100 DOOR HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work under this section comprises the furnishing and installation of finish and security hardware specified herein and noted on drawings for a complete and operational system, including any electrified door hardware components including finish and security hardware and auto operators for aluminum entrance doors, FRP doors, and wood doors.
- B. Items include but are not limited to the following:
 - 1. Hinges: Butt-type and Continuous
 - 2. Flush Bolts: Manual and Automatic
 - 3. Exit Devices
 - 4. Locksets and Cylinders
 - 5. Push Plates - Pulls
 - 6. Coordinators
 - 7. Closers / ADA Operators
 - 8. Kick, Mop and Protection Plates
 - 9. Stops, Wall Bumpers, O.H. Controls
 - 10. Thresholds, Gasketing and Door Bottoms
 - 11. Silencers
 - 12. Miscellaneous Trim and Accessories
 - 13. Electrified Hardware Items, Controls and Power Supplies

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Supplementary conditions and Division 1 specifications sections apply to this section.

1.3 RELATED WORK

- A. Work specified elsewhere that should be examined for its effect upon this section.
 - 1. Section 081113, Hollow Metal Doors and Frames
 - 2. Section 081416, Flush Wood Doors
 - 3. Section 084113, Aluminum-Framed Entrances and Storefront
 - 4. Section 088000, Glazing
 - 5. Section 088813, Fire-Resistant Glazing.
 - 6. Division 26 Electrical.

- 7. Division 28 Electronic Safety and Security.
- 8. Division 1 Alternates.

1.4 REFERENCES SPECIFIED in this section subject to compliance by:

- A. NFPA-80-2013 - Standard for Fire Doors and Windows.
- B. NFPA-101- Life Safety Code as adopted.
- C. NC Electrical Code – 2014, effective as April 2016.
- D. ADA - The Americans with Disabilities Act - Title III - Public Accommodations
- E. ANSI-A117.1-1992 American National Standards Institute - Accessible and Usable Buildings and Facilities
- F. ANSI-A156.5-American National Standards Institute - Auxiliary Locks and Associated Products
- G. UL 10 C – UBC 7.2 – Positive Pressure Testing
- H. ANSI-A250.6-1997/SDI -107" Hardware on Steel Doors" (reinforcement- application).
- I. Architectural Woodwork Institute (AWI)
- J. International Building Code as Adopted / NC Building Code as adopted
- K. U.L. - Underwriter's Laboratories
- L. WHI - Warnock Hersey International, Division of Intertek Testing Services
- M. State and Local Codes including Authority Having Jurisdiction.

1.5 SUBMITTALS

- A. Shop Drawings: Indicate door and frame elevations and sections, materials, gauges, finishes, door thickness, door swing, stile and rail dimensions, veneers, undercuts, fabrication and erection details, locations of finish hardware by dimension and locations/details of all openings and louvers. Do not proceed with any fabrication until all details are approved.
- B. Hardware Schedule: Submit copies of schedule in accordance with Division 1 – "Submittals", General Requirements. Schedule to be in vertical format, listing each door opening, including: Keying Information, handing of opening, all hardware scheduled for each opening or otherwise required to allow for proper function of door opening as intended, and finish of the hardware. At doors with door closers or door controls include degree of door opening. All submittals (schedules, cut sheets, wiring diagrams, operational descriptions and elevation drawings) shall be reviewed and approved by the

UNCW Project Manager and by the UNCW Locksmith Supervisor Physical Plant. UNCW Business Applications shall review the submittal for electrified hardware applications, along with the wiring diagrams. These submittals shall be approved by UNCW prior to ordering of materials. The Hardware Supplier shall submit the schedules and all templates within three (3) weeks from the date the purchase order is received from the GC.

- C. Manufacturer's Catalog Cuts: Submit manufacturer's cut/catalog sheets on all hardware items and any required special mounting instructions with the hardware schedule.
- D. Certification of Compliance: Submit any information necessary to indicate compliance to these specifications.
- E. Wiring Diagrams: Provide complete wiring diagrams for each opening requiring electrified hardware. Provide a copy with each hardware schedule submitted after approval. Supply a copy with delivery of hardware to job site and another copy to the Owner at time of job completion. All electrical components shall be listed by opening, in the hardware submittals.
- F. Operational Descriptions: Provide complete operational descriptions of electronic components listed by opening in the hardware submittals. Operational descriptions to detail how each electrical component functions within the opening including all conditions of ingress and egress. Provide a copy with each hardware schedule submitted for approval. Supply another copy with delivery of hardware to job site and another copy to owner at time of job completion.
- G. Elevation Drawings: Provide elevation drawings of electronic hardware and systems identifying locations of the system components with respect to their placement in the door opening. Provide a copy with each hardware schedule submitted for approval. Supply another copy with delivery of hardware to job site and another copy to the Owner at time of job completion.

1.6 QUALITY ASSURANCE

- A. Door Openings Supplier shall be a qualified direct distributor of products to be furnished. In addition, the distributor shall have in their regular employment an A.H.C./C.D.C. or person of equivalent experience, who will be available at reasonable times to consult with the Architect/Contractor and/or Owner regarding any matters affecting the door opening assembly.
- B. All hardware used in labeled fire or smoke rated openings to be listed for those types of openings and bear the identifying label or mark indicating UL (Underwriter's Laboratories) or Warnock Hersey (WHI) approved for fire. Exit Devices. Non-labeled openings to be listed for panic application.
- C. Pre-Installation Meetings: The Contractor shall initiate and conduct a jobsite meeting with the supplier and installer, and all related trades for mechanical hardware, and a meeting for Electronic Hardware. This meeting shall convene at least one month prior to commencement of the related work. All approved shop drawings and schedules shall

be made available to all related trades as required for work to be performed. Prior to installation of wiring, and installation of power supplies for electronic hardware, arrange conference between supplier, installers and related trades to review materials, procedures, review door opening functions, and coordinating related work. The Owner's Construction Project Manager and the Locksmith Supervisor -Physical Plant shall attend all pre-install meetings. The Owner's Construction Project Manager, and the Business Applications Services representative.

- D. All hardware products furnished to the project, shall be furnished by an authorized distributor of each product to insure quality compliance, service, and warranty of the products. Product representatives of the following products: Locksets, Closers, Exit Devices, Electrified Hardware, shall conduct a certified training session at the pre-install meeting for product installation training.
- E. All closers and exit devices shall be mounted to doors with the manufacturer's recommended sex-nut/through-bolt fasteners.
- F. Keying Conference: A keying Conference shall be conducted at least 30 days after approval of all hardware submittals on each Building Project. Attendance to this conference shall be: UNCW Construction Project Manager, the area Department Heads, the UNCW Locksmith -Physical Plant and the Schlage Key representative.

1.7 DELIVERY, STORAGE AND HANDLING

A. Finish Hardware

- 1. Furnish all hardware with each unit clearly marked and numbered in accordance with the hardware schedule. Include door and item number for each.
- 2. Pack each item complete with all necessary parts and fasteners.
- 3. Properly wrap and cushion each item to prevent scratches and dents during delivery and storage.
- 4. Inventory hardware jointly with the General Contractor, Hardware Distributor and Installer until each is satisfied that all products and counts are correct. Any shortages shall be replaced immediately.
- 5. The General Contractor shall provide secure lock up in a clean, dry, well-lit space for finish and security hardware storage as delivered to the Project. Control handling and installation of hardware and security items to insure the installation will not be delayed due to hardware losses, both before and after installation.
- 6. Hardware shipped to the jobsite is to be packaged in biodegradable packs such as paper or cardboard boxes and wrapping. If non-biodegradable packing such as plastic, plastic bags or large amounts of styrofoam is utilized, then the Contractor will be responsible for the disposal of the non-biodegradable packing to a licensed or authorized collector for recycling of the non-biodegradable packing.

7. The Manufacturers' Representative and Owners Representative will make several inspections of the installation of Finish and Security Hardware during that phase of construction. Any deficiencies in installation of all products in this Section shall be corrected before installation continues.

1.8 SEQUENCING AND SCHEDULING

- A. Deliver all openings components to the job site in a timely manner so not to delay progress of other trades.

1.9 WARRANTY

- A. Hardware Warranty: Part of respective manufacturers' regular terms of sale. Provide manufacturers' warranties:
 1. Hinges: Life of the building.
 2. Mortise Locksets shall carry manufacturer's 3-year warranty against manufacturing defects and workmanship.
 3. Door closers shall carry manufacturer's 30-year warranty against manufacturing defects. Exit devices shall carry manufacturer's 3-year warranty against manufacturing defects and workmanship.
 4. Continuous gear hinges shall carry manufacturer's Lifetime warranty to be free from defects in material and workmanship.
 5. ADA operators shall carry manufacturer's 2-year warranty against manufacturing defects and workmanship.
 6. Balance of items shall carry a manufacturer's 1-year warranty against manufacturing defects and workmanship.
- B. During the warranty period, replace defective work, including labor, materials and other costs incidental to the work. Inspect the work within 24 hours after receipt of notice from the UNCW Construction Project Manager.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Furnish finish hardware with all necessary screws, bolts and other fasteners of suitable size and type to anchor the hardware in position for a long life under hard use.
- B. Furnish fastenings where necessary with expansion shields, toggle bolts and other anchors designated by the Architect according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer. **All door closers and exit devices shall be thru-bolted mounted.**
- C. All thresholds shall be fastened with machine screws and anchors. Where specified in the hardware sets, security type fasteners of the type called for are to be supplied.

- D. Design of all fastenings shall harmonize with the hardware as to material and finish.
- E. Provide products as hereafter specified. Substitutions other than those manufacturers listed a Approved Equals must be approved, in writing, via addenda, prior to bid. Procedure for substitutions shall be as outlined in Division 1. No substitutions will be considered after award of contract.

2.2 HINGES

- A. Provide full mortise type, five knuckle exposed tip design ball bearing hinges as specified. Continuous Geared Hinges shall be furnished for all exterior doors with card reader applications and at all Storefront and FRP type doors. Continuous Hinges shall be furnished at any interior door as directed by the Project Manger during the project review. Verify all continuous hinge applications. Unless otherwise scheduled, the required weight, size and hinge type shall be as follows:
 - 1. Butt hinges required per door leaf:
 - a. Doors up to 5'0" in height 2 hinges
 - b. Doors over 5'0" to 7'6" in height 3 hinges
 - c. Doors over 7'6" to 9'0" in height 4 hinges
 - 2. Size and weight requirements:
 - a. Doors over 36" in width, shall have extra-heavy weight hinges, 5 inches in width.
 - b. At exterior openings, hinge pins shall be stainless steel.
- B. Finish: Except as otherwise indicated, provide all hinges with the following finish:
 - 1. Exterior US32D (630) Satin Stainless Steel
 - 2. Interior US26D (652) Satin Chrome
- C. Approved Butt Hinge Manufacturers: Ives, McKinney, Hager
- D. Approved Continuous Geared Hinge Manufacturer: Select, Ives, McKinney. **At exterior doors with card reader function, the continuous hinge shall be as Select 11HD EMS/CTW-8 RP (removable panel).**

2.3 LOCK CYLINDERS AND KEYING

- A. General: Provide ten (10) temporary keyed construction cores for the contractor's use during the construction period of the project. Furnish keyed construction cores at all exterior doors, including the cylinder dogging at exit devices. Balance of locks/cylinders may be furnished with factory produced plastic plugs. Construction control and operating keys and cores shall not be part of the Owner's permanent keying system, or furnished on the same keyway as the Owner's permanent keying system. Permanent cores and keys shall be keyed to the approved keying schedule. All cylinders shall be Everest 7-pin, interchangeable core and keyed to existing patented Factory-Registered Grand Masterkey System.

- B. Permanent keys and cores shall be stamped with applicable key mark for identification. These visual key control codes shall not include the actual key cuts. Permanent keys/key blanks will also be stamped "Do Not Duplicate."
- C. The Owner's existing key system: "Schlage", with the specific keyway to be determined by the Owner, and with the Schlage Key representative.
- D. Furnish keys in the following quantities:
 - 2 each Master keys per set
 - 3 each Change Keys per keyed core or keyed group. Do not cut keys for any exterior door cylinders where the UNCW card reader function is specified.
 - 2 each Construction Master keys
 - 3 each key blanks per core
- E. At project completion, the UNCW Locksmith Shop shall install the permanent keyed cores. All construction cores and keys shall be returned to the University Construction Project Manager for return the hardware supplier. All permanent keyed cores, keys, and key blanks shall be delivered directly to the Owner from the hardware supplier via Registered Delivery, Return Receipt Required.

2.4 LOCKS, LATCHES AND BOLTS

- A. Mortise Lock and Latches shall be as manufactured by Schlage, series L9000, Grade 1. Trim design shall be as manufactured by Schlage, 17N. Finish shall be: 626 (US26D), unless otherwise noted. Locksets and Latchsets shall be UL listed for use on fire doors. Furnish latch bolts with $\frac{3}{4}$ " minimum throw. Deadbolts shall have 1" throw. All strikes shall be curved lip. Lock function at all instructional/classroom door shall include a thumb-turn and an indicator on the inside trim to indicate the status of the outside trim: locked/unlocked. Acceptable manufacturers: Schlage L series; Falcon M series; Best 42H series.
- B. Provide knurled levers or abrasive strips to all rooms that are considered hazardous, in order to comply with the North Carolina Building Code requirements. This includes but is not limited to all electrical, mechanical and telecommunications rooms.
- C. Auxiliary Locks shall be Grade 1, as scheduled.
- D. Padlocks: Provide a hardware set for each project to include the following padlock as manufactured by: Schlage KS41F1200 x less core x 2" shackle. Verify with the Owner's Construction Project Manager for the quantity required for each project. The Owner will not accept an "add" change order for padlocks not include with the Hardware Submittal.
- E. Cylinders used in any locking mechanism such as in Rolling/Overhead/Coiling Doors, or for a remote Key Switch, shall be furnished with a Schlage Everest 7-pin SFIC housing and keyed core, and follow the UNCW keying requirements listed per Section 2.3 of this document.

- F. Locksets at all teaching spaces shall include a classroom locking function with a thumb-turn and an indicator.

2.5 CLOSERS

- A. General: One manufacturer for closer units throughout the Project Work, including surface closers, overhead-concealed closers, and electromagnetic hold-open closers.
- B. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.
- C. Surface Closers:
1. Door Closers shall be heavy-duty type, Grade 1 with thirty-year warranty.
 2. Cylinders shall be cast iron with forged 1 ½" diameter steel.
 3. Closer main arm shall be forged on all closers. Parallel arms shall be rigid forearms.
 4. Shaft/Pinion shall be 11/16" diameter shaft and double heat-treated.
 5. All closers shall have "all-weather" hydraulics to operate in temperatures from – 30degrees to 120 degrees F. without valve adjustments and conforms to positive pressure fire test standards UL10C & UBC 7-2.
 6. All stop arm and spring stop arm closers shall have bronze bushings and shoulder bolts. Where stop type arm is specified, closer shoe shall have a cast-in solid stop. Where spring stop arm is specified, arm shall provide an additional five-degree cushion.
 7. Closers shall be certified by an independent testing laboratory to Ten Million (full load) cycles.
 8. Closers shall be ISO 2000 certified. Units shall be stamped with date-of-manufacture code.
 9. Closers shall be thru-bolt mounted.
 10. Provide plates, brackets and special templating as specified and per manufacturer's recommendation.
 11. Spring power shall be continuously adjustable over the full range of closer sizes and allow for reduced opening force for the physically handicapped.
 12. Acceptable manufacturers: LCN 4111/4011 series; Norton 7501PR series w/ extra duty forged arms; Sargent 281 series with extra duty forged arms.
 13. Pressure relief valves are not acceptable.
- D. ADA Operators: Where low kinetic energy, as defined by ANSI/BHMA Standard A156.19, power operators are specified for doors required are to be accessible to the disabled, furnish electro-hydraulic or electro-mechanical, as specified. Powered operators shall comply with ADA guidelines for opening force and time to close

standards. Full closing force shall be provided when the power or assist cycle ends. All power operator systems shall include the following features and functions:

1. Provisions for separate conduits to carry high and low voltage wiring in compliance with the National Electrical Code, section 725-31.
2. The operator shall be designed to prevent damage to the mechanism if the system is actuated while the door is latched or if the door is forced closed during the opening cycle.
3. All covers, mounting plates and arm systems shall be powder coated and successfully pass a minimum of 100 hours testing as outlined in ANSI/BHMA Standard A156.18.
4. UL listed for use on labeled doors.
5. All operators shall be non-handed with spring power over a range of at least four sizes; either 1 through 4 or 2 through 5.
6. Provisions in the control box or module shall provide control (inputs and outputs) for: electric strike delay, auxiliary contacts, sequential operation, fire alarms systems, actuators, swing side sensors, stop side sensors. The operator shall provide a power shut-off switch to the operator control box. The ADA operator supplier shall indicate this switch on the wiring diagram submittal as reference only.
7. All electrically powered operators shall include the following features or functions:
 - a. "second chance feature": when an obstruction or resistance to the opening swing is encountered, the operator will pause at that point, then attempt to continue opening the door. If the obstruction or resistance remains, the operator will again pause the door.
 - b. Easily accessible main power and maintain hold-open switches will be provided on the operator.
 - c. An electronically controlled clutch to provide adjustable opening force.
 - d. A microprocessor to control all motor and clutch functions.
 - e. An on-board power supply capable of delivering both 12V and 24V outputs up to a maximum of 1.0 ampere combined load.
 - f. All input and output power wiring shall be protected by slow blow fuses. These fuses shall be easily replaceable without special tools or component replacement.
8. Electrical control functions shall be provided by a control module in lieu of a separate control box. Only two Actuators shall be required to create the complete, stand alone, powered door system(s). All components: ADA operator, electrified exit device, keypads, and card readers shall be compatible and operate in compliance with Life Safety, ADA regulations, and with the authority having jurisdiction. ADA operators shall be UL and NEC compliant, including the soft-start motor control and meet the following Standards. ADA Law Section 4.13.12 / ANSI A156.19, Section 2.1 / ANSI A117.1, Section 4.13.13 / UL 325 / UL Listed for Fire Rated Door Operators with Automatic Closers, File (GUJY).
9. All door closers, closer controls and ADA Operators shall be the products of one manufacturer.

10. ADA Operators shall be as LCN 4630/4640 series.
11. Acceptable manufacturers shall meet all of the above specified features and descriptions.

2.6 EXIT DEVICES

- A. General: All devices shall be the products of one manufacturer to provide for proper installation and servicing. Devices shall be furnished non-handed and capable of direct field conversion of all available trim functions. All devices shall carry a three-year warranty against manufacturing defects and workmanship.
 1. Furnish all devices with stainless steel touch bars. Plastic parts are not acceptable.
 2. Furnish all exit devices with deadlocking latchbolts or guarded latch (GL) feature.
 3. Furnish all exit devices with cast metal end caps.
 4. Furnish built-in damping / silencing feature. Furnish heavy duty, chassis mounted design with removable cover to eliminate the need to remove the device from the door for maintenance or cylinder change out. Device springs shall be compression type only. Torsion springs are not acceptable.
 5. Furnish roller strikes with all exit devices.
 6. Furnish stabilizers similar to Von Duprin 154 with keyed locking feature at all removable mullions.
 7. All Exit Devices and mullions shall be from one manufacturer.
 8. All latchbolts shall be deadlocking. Latchbolts shall be moly-coated.
 9. Lever trim shall be solid cast material with a break-away feature to limit damage to the unit from vandalism.
 10. Exit devices at instructional/classrooms shall include a thumb-turn and indicator on the device head.
 11. Acceptable Manufacturer: Von Duprin 99/98 series devices; Precision 2100 series x deadlocking latchbolts and roller strikes; Sargent 80 series with deadlocking latchbolts and roller strikes. Keyed removable mullions shall be as manufactured by Von Duprin KR4954/9954 series, and shall include stabilizer kits. Mullion shall be by the same manufacturer as the exit device.
 12. Surface Vertical Rod devices are not acceptable.
 13. Concealed exit device application shall be concealed cable device and only as approved by the UNCW Locksmith. Concealed cable device shall include the option for less bottom cable, electrified options as required for card reader applications, fire-rating as required by the door, and out-side trim options which match the rim devices.
 14. Electrified functions shall be specified and furnished as Request to Exit and Electric Latch Retraction (QEL-RX-LC). Each opening specified with Request to Exit and Electric Latch Retraction shall be specified and furnished with a PS914-

4RL power supply box. The power supply boxes and electrified exit devices shall be by the same manufacturer. Power supply box shall have a regulated output, field selectable for either 24VDC @2 amps or 12VDC @ 4amps. The input shall be universal at 120VAC @ 1 amp or 240VAC @ 0.5amp. The option board compatibility shall include 2 relay QEL panic device control board. The power supply shall have five (5) knockout holes for conduit connection with a terminal block that handles up to 14 gauge size wire.

2.7 DOOR TRIM UNITS

- A. Fasteners: provide manufacturers standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops and similar units): either machine screws or self-tapping screws.
- B. Fabricate edge trim of stainless steel, not more than 1/2" nor less than 1/16" smaller in length than door dimension.
- C. Fabricate protection plates (armor, kick or mop) not more than 2" less door width on stop side and not more than 1" less door width on pull side X the height indicated.
- D. Metal Plates: Stainless Steel .050" (U.S.18ga.), unless otherwise specified.
- E. Approved Manufacturers: Ives/ Rockwood/Trimco

2.8 MISCELLANEOUS

- A. Provide manual or automatic flush bolts, including coordinators and mounting brackets at pairs of doors as specified.
- B. Generally provide door stops or controls at each door leaf. Provide wall, floor. or stops and holders as specified.
- C. Provide OH Controls, stops or holders as specified.
- D. Approved Manufacturers: Ives/ Glynn Johnson/ Rixson

2.9 THRESHOLDS /WEATHERSTRIP

- A. General: Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf. Provide type, size and profiles shown or specified. Provide non-corrosive fasteners as recommended by manufacturer for application intended. Except as otherwise indicated provide ADA standard aluminum thresholds of type, size and profile specified.
- B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from manufacturers stock.
- C. Acceptable Manufacturers: National Guard/Pemko/Zero.

- D. Provide thresholds that are 1" wider than frame depth. Unless return closed ends are specified, furnish thresholds 2" longer than the opening width for notching around the frame. Hardware installer shall be responsible for notching thresholds to the frame by field measuring after the door opening assembly is installed.

2.10 DOOR SILENCERS

- A. At all hollow metal frames furnish gray resilient rubber silencers. Quantity: Three each at single door openings; two each at double door openings.

2.11 KEY LOCK BOX

- A. Furnish one each secure storage box for emergency personnel use. This box shall be located per the architect and fire marshal at the exterior of the building.
- B. Dual Lock Model, Recessed Mount, 1/4" plate steel housing, 5/8" thick steel door with interior gasket seal. Vault and Lock UL listed. Lock has 1/8" dust cover with tamper seal mounting capability. Vault has anti-theft re-locking mechanism with drill resistant hard-plate lock protector.
- C. Acceptable Manufacturers: Knoxbox 3200

2.12 ELECTRIFIED HARDWARE FUNCTIONS

- A. General: Operation of the card reader access control system shall be managed by the UNCW Business Applications Department. *Card readers, credentials, monitoring, alarms shall be furnished under Division 28. Refer to the current UNCW Standards & Procedures for Installation of Access Control Equipment* by UNCW Physical Security & Access Department.
- B. Where specified in the Finish and Security Hardware Sets openings shall be furnished with all materials listed to provide the security function and control required by the Owner.
- C. The door function shall be as specified in the Part 3 – Hardware Sets. Finish Hardware submittals shall include operational descriptions and wiring diagrams for all electrified hardware functions.
- D. Card reader equipment shall be provided and installed by the Division 28 subcontractor. Handicap Operators shall be installed and terminated by the General Contractor and/or the Hardware Installer. UNCW Information Technology Systems Division shall install required bridge wiring after door operator is installed. All electrical applications specified shall be confirmed by review with the UNCW Physical Security & Access Department.
- E. All exterior building entry doors shall be specified with one or more of the above listed electrical functions, or the openings shall be specified with provision for future card readers and electrified hardware.

2.13 OWNERS SERVICE AND STOCK ITEMS

- A. Provide four (4) Final Field use Finish and Security Hardware Schedules with Cut Sheets, Service Instructions and any materials pertinent to the service and maintenance of the Hardware and Systems.
- B. Provide four (4) Sets of all Electrical Drawings illustrating Riser and Point-to-Point Diagrams.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount hardware units at heights indicated in the following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by the Architect. Mounting Height of exit devices, with the exception of full glass aluminum doors, shall not interfere with lite kits shown on elevations. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Install with only fasteners furnished with each hardware item, or exact match if additional fasteners are required. Any substitute fastener shall be approved by UNCW Locksmith Supervisor prior to installation. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Section. Do not install surface mounted items until finishes have been completed on the substrates involved.
 - 1. Gaskets: install jamb-applied gaskets before door closers, overhead stops, rim strikes, etc. Install sweeps across bottoms of doors before astragals. Trim astragals to tops of sweeps.
 - 2. Locate floor stops not more than 4 inches from the wall.
 - 3. Drill pilot holes for fasteners in wood doors and/or frames.
 - 4. Thru-Bolts: All closers and exit devices.
- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers".
- F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

- G. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.
- H. Certified installers: Contractor's personnel, and Section 087100 supplier/installer shall be certified prior to installation of exit devices, locksets, closers, and electrified hardware, including ADA operators, electric strikes, electrified hinges, electric exit devices, and electric door releases. Certification shall be obtained by attendance of manufacturer's training at the pre-install meeting. The manufacturer's representative shall provide written certification to the installers and a copy of the certification shall be provided to the Contractor, the University Construction Project Manager, and the University Locksmith Supervisor. Hardware Installers working on the project site not certified by attending the above specified training, shall be removed from the project site.
- I. All conduit, outlet and backboxes, provisions for 120VAC power, wiring types required for access control system, pulling of correct wiring to appropriate locations, fire alarm system installation and interface, coordination of electrical applications shall be furnished by the Electrical Contractor (Division 26).

3.2 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and system of each door to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surfaces soiled by Hardware Installation. Avoid the use of caustic cleaners which may mar the finish of the Hardware.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to work one week before final acceptance and make final check and adjustment of all hardware in such space or area. Clean operating items as necessary. Adjust door controls after HVAC Test and Balance to insure proper door control.
- D. Instruct Owners Personnel in the proper adjustment and maintenance of Hardware and Systems during the final adjustment period.
- E. Continued Maintenance Service: Approximately six (6) months after acceptance of the Project, the Installer, accompanied by the Owners representative and the Finish and Security Hardware Representative(s) shall return to the project and survey the project, readjusting any items as required to restore the hardware to its original function. Replace any failed products failed due to faulty design, materials or installation. Prepare and deliver to the Owners representative a written report of any potential problems in the performance of the hardware with recommended service procedures to insure continued correct function of the products.

3.3 INSPECTION

A. Door Hardware Supplier's Field service:

1. Inspect door hardware items for correct installation and adjustment prior to Owner's permanent core installation. The hardware installer shall be present for this inspection. The Owner shall give written notice to the Contractor 5 days prior to inspection. The Hardware Supplier shall submit a written report of the inspection, including any exceptions noted during the inspection, to the Contractor, Architect, the University Construction Project Manager, and the University Locksmith Supervisor.
2. The Hardware Installer Shall reply to the inspection report within three (3) working days after the inspection report. The Installer's response shall include a list of the required repairs or alterations, and the date the repair work shall be performed. All repairs, and or alterations shall be performed with one week after the Installer's response report.
3. The written inspection report and the Installer's repair report shall become part of the Contractor's punch list report. All reports shall be submitted to the project architect, and the University Construction Project Manager.

3.4 HARDWARE SETS

Access Control System equipment, including card readers, wiring, connections, and any system related work shall be provided by others. All Electrical work shall be by Div. 26.

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters per ASTM C 1036.

1.3 PERFORMANCE REQUIREMENTS

- A. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in thickness designations indicated for various size openings, but not less than thicknesses and in strengths required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 60 seconds or less. [3 seconds].
 - b. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.
 - 1) For insulating glass.
 - c. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.

Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- B. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- C. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Glass: Obtain each glass type through one source from a single manufacturer.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- C. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- D. Glazing for Fire-Rated Door and Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for doors and NFPA 257 for windows (sidelights).
- E. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
 - 1. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. (0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials; for lites 9 sq. ft. (0.84 sq. m) or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- F. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA Bulletin 01-0300 - Proper Procedures for Cleaning Architectural Glass Products and GANA's "Glazing Manual."
 - 2. IGMMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

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.

2.2 GLASS PRODUCTS

- A. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
 - 1. For uncoated glass, comply with requirements for Condition A.
 - 2. For coated vision glass, comply with requirements for Condition C (other uncoated glass).

2.3 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene, ASTM C 864.
 - 2. EPDM, ASTM C 864.
 - 3. Silicone, ASTM C 1115.
 - 4. Thermoplastic polyolefin rubber, ASTM C 1115.
 - 5. Any material indicated above.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene.
 - 2. EPDM.
 - 3. Silicone.
 - 4. Thermoplastic polyolefin rubber.
 - 5. Any material indicated above.

2.4 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3. Colors of Exposed Glazing Sealants: Selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses for exposure and joint substrates.
 1. Medium Modulus, Neutral-Curing Silicone Glazing Sealants:
 - a. Available Products:
 - 1) Dow Corning Corporation; 795.
 - 2) GE Silicones; SilPruf NB SCS9000.
 - 3) GE Silicones; UltraPruf II SCS2900.
 - 4) Pecora Corporation; 895.
 - 5) Tremco; Spectrem 2.
 - b. Type and Grade: S (single component) and NS (nonsag).
 - c. Class: 50.
 - d. Use Related to Exposure: NT (nontraffic).
 - e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
 - 1) Use O Glazing Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and wood.
 - f. Applications: Exterior glazing unless noted otherwise.
 - C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.7 MONOLITHIC FLOAT-GLASS UNITS

- A. Uncoated Clear Float-Glass Units (**Glazing Type 1**): Class 1 (clear) Kind FT (fully tempered) float glass.
 - 1. Thickness: 6.0 mm.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing to receive glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm) as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. Use glazing tape thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape for exterior exposures.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.7 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 088000

SECTION 089000 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.
- C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- D. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 - 1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
 2. Show mullion profiles and locations.
 3. Wiring Diagrams: For power, signal, and control wiring for motorized adjustable louvers.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of metal finish required.
- E. Delegated-Design Submittal: For louvers indicated to comply with structural performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.2, "Structural Welding Code - Aluminum."
 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.
- D. UL and NEMA Compliance: Provide motors and related components for motor-operated louvers that are listed and labeled by UL and comply with applicable NEMA standards.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
1. Use Phillips flat-head, hex-head, Phillips pan-head, or tamper-resistant screws for exposed fasteners unless otherwise indicated.
 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- 3. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
- 4. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
 - 1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
 - 2. Horizontal Mullions: Provide horizontal mullions at joints where indicated, unless continuous vertical assemblies are indicated.
- C. Maintain equal louver blade spacing, including between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
 - 1. Frame Type: Channel unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.
 - 1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
 - 2. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
 - 3. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
- G. Provide subsills made of same material as louvers or extended sills for recessed louvers.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- H. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Air Balance Inc.; a Mestek company.
 - b. Air Flow Company, Inc.
 - c. Airolite Company, LLC (The).
 - d. All-Lite Architectural Products.
 - e. American Warming and Ventilating, Inc.; a Mestek company.
 - f. Arrow United Industries; a division of Mestek, Inc.
 - g. Construction Specialties, Inc.
 - h. Greenheck Fan Corporation.
 - i. Industrial Louvers, Inc.
 - j. NCA Manufacturing, Inc.
 - k. Nystrom Building Products.
 - l. Reliable Products, Inc.
 - m. Ruskin Company; Tomkins PLC.
 - n. United Enertech Corp.
2. Louver Depth: Nominal 6 inches unless indicated otherwise.
3. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and 0.080 inch for frames.
4. Mullion Type: Exposed.
5. Louver Performance Ratings:
 - a. Free Area: Not less than 6.0 sq ft for 48-inch-wide by 48-inch-high louver.
 - b. Air Performance: Not more than 0.10-inch wg static pressure drop at 600-fpm free-area intake velocity.
 - c. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 3 inches per hour and a wind speed of 29 mph at a core-area intake velocity of 300 fpm.
6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
1. Screen Location for Fixed Louvers: Interior face.
 2. Screening Type: Bird screening except where insect screening is indicated.
- B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
 2. Finish: Mill finish unless otherwise indicated.
 3. Frame Type for Insect Screen: Rewirable frames with a driven spline or insert.
 4. Frame Type for Bird Screen: Non-rewirable, U-shaped frames.
- D. Louver Screening for Aluminum Louvers:
1. Bird Screening: Flattened, expanded aluminum, 3/4 by 0.050 inch thick.
 2. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch wire.

2.5 BLANK-OFF PANELS

- A. Insulated, Blank-Off Panels: Laminated panels consisting of insulating core surfaced on back and front with metal sheets and attached to back of louver.
1. Thickness: 1 inch.
 2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
 3. Insulating Core: Rigid, glass-fiber-board insulation or extruded-polystyrene foam.
 4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
 5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
 6. Panel Finish: Same finish applied to louvers.
 7. Attach blank-off panels with sheet metal screws, or alternate method acceptable to A/E.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.7 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
1. Color and Gloss: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.
- B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089000

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 092216 - COLD FORMED STEEL FRAMING - NON-STRUCTURAL (CFSF-NS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For firestop tracks, from ICC-ES.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, 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.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners: ASTM C 645.
 - 1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: Minimum 0.018 inch (0.45 mm) unless indicated otherwise and as required by ASTM C 754 to meet L/240 deflection limit at a lateral pressure of 5psf. Provide 0.030 inch (0.79 mm) for high-density board applications, such as ASTM C 1178 tile backing panels and ASTM C 1629 Abuse-Resistant Gypsum Board, and at door frames. Provide minimum 0.030 inch (0.79 mm) for walls receiving heavy wall-hung items or loads, including but not limited to wall cabinets, wall-hung countertops, TV brackets, liquid tanks, folding and fixed seats, grab bars, handrails, exercise equipment, and shelving greater than 9 inches deep and over 3 feet in length.
 - b. Depth: 3 5/8 inch unless indicated otherwise.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
 2. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ClarkDietrich Building Systems; MaxTrack Slotted Deflection Track.
 - 2) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
 - 3) Superior Metal Trim; Superior Flex Track System (SFT).
- D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ClarkDietrich Building Systems; BlazeFrame Fire Stop Deflection Track.
 - b. Fire Trak Corp.; Fire Trak System[attached to studs with Fire Trak Posi Klip].
 - c. Metal-Lite, Inc.; The System.
 - d. Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).
- F. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 1-1/2 inches (38 mm), unless indicated otherwise.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm), unless indicated otherwise.
 2. Depth: 7/8 inch (22.2 mm), unless indicated otherwise.
- H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical for wall applications.
- I. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 3/4 inch (19 mm), unless indicated otherwise.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of **0.033 inch (0.8 mm)**.
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.062-inch- (1.59-mm-)** diameter wire, or double strand of **0.048-inch- (1.21-mm-)** diameter wire.
- J. Z-Shaped Furring: With slotted or nonslotted web, face flange of **1-1/4 inches (32 mm)**, wall attachment flange of **7/8 inch (22 mm)**, minimum uncoated-metal thickness of **0.018 inch (0.45 mm)**, and depth required to fit insulation thickness indicated.
- K. Corner Angle: Angle with both face flanges of **2-1/2 inches (63.6 mm)**, minimum bare metal thickness of **0.0179 inch (0.45 mm)**.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.062-inch- (1.59-mm-)** diameter wire, or double strand of **0.048-inch- (1.21-mm-)** diameter wire.
- B. Hanger Attachments to Concrete:
 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to **5** times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, expansion anchor.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.16 inch (4.12 mm)** in diameter.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of **0.053 inch (1.34 mm)** and minimum **1/2-inch- (13-mm-)** wide flanges.
 1. Depth: **2-1/2 inches (64 mm)**.
- E. Furring Channels (Furring Members):
 1. Cold-Rolled Channels: **0.053-inch (1.34-mm)** uncoated-steel thickness, with minimum **1/2-inch- (13-mm-)** wide flanges, **3/4 inch (19 mm)** deep.
 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: **0.018 inch (0.45 mm)**, unless indicated otherwise.
 - b. Depth: As indicated on Drawings.
 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, **7/8 inch (22 mm)** deep.
 - a. Minimum Base-Metal Thickness: **0.018 inch (0.45 mm)**, unless indicated otherwise.
- F. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 1. The USG "Drywall Suspension System" accessory components for inside and outside corner joinery of main grid members for construction of "boxed soffits" and bulkheads without stud partition framing is acceptable in lieu of stud framed soffit type construction.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. 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 one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754. Provide framing to meet L/240 deflection limit at a lateral pressure of 5 psf unless indicated otherwise.
 - 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. Provide for such indicated construction whether in contract or not. Coordinate for such construction provided by others.
- 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.

3.3 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated. Provide closer spacing if required by ASTM C 754 to meet L/240 deflection limit at a lateral pressure of 5psf.
 - 2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where indicated otherwise. Continue framing around ducts penetrating partitions above ceiling. Provide bracing of top track at non full-height framing as indicated.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. 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.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
 - 1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Stand-Off Framing:
 - 1. Where metal framing is indicated directly beside a primary wall and to receive finish board on only one side, provide bracing to the primary wall at no less than 48 inches o.c. between floor and ceiling. Attach bracing to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- G. Z-Furring Members:
 - 1. Erect insulation, specified in Division 07 Section "Thermal Insulation," vertically and hold in place with Z-furring members spaced 24 inches (610 mm) o.c.
 - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than **12 inches (305 mm)** from corner and cut insulation to fit.

- H. Installation Tolerance: Install each framing member so fastening surfaces vary not more than **1/8 inch (3 mm)** from the plane formed by faces of adjacent framing.

3.4 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: **48 inches (1219 mm)** o.c.
 2. Carrying Channels (Main Runners): **48 inches (1219 mm)** o.c.
 3. Furring Channels (Furring Members): **16 inches (406 mm)** o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- F. Installation Tolerances: Install suspension systems that are level to within **1/8 inch in 12 feet** (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals: Refer to Division 1 Section "Sustainable Design Requirements."

1.3 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

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.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.2 GYPSUM BOARD, GENERAL

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 52 percent.
- B. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- C. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch (15.9 mm) unless indicated otherwise.
 - 2. Long Edges: Tapered.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered.
- C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch (15.9 mm) unless indicated otherwise.
 - 2. Long Edges: Tapered.
- D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and facing surfaces.
 - 1. Core: 5/8 inch (15.9 mm), Type X unless indicated otherwise.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10.
 - 4. Water Absorption: ASTM C 473, less than 5%.

2.4 SPECIALTY GYPSUM BOARD

- A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum; Firebloc Type C.
 - b. CertainTeed Corp.; ProRoc Type C.
 - c. Georgia-Pacific Gypsum LLC; Fireguard C.
 - d. Lafarge North America Inc.; Firecheck Type C.
 - e. National Gypsum Company; Gold Bond Fire-Shield C.
 - f. PABCO Gypsum; Flame Curb Type Super C.
 - g. Temple-Inland; Type TG-C.
 - h. USG Corporation; Firecode C Core.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
3. Long Edges: Tapered.

2.5 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

- A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; GlasRoc Sheathing.
 - b. Georgia-Pacific Gypsum LLC; Dens-Glass Gold.
 - c. National Gypsum Company; Gold Bond, e2XP.
 - d. USG Corporation; Securock Glass Mat Sheathing.
 2. Core: 5/8 inch (15.9 mm), Type X unless indicated otherwise.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 1. Material: Paper-faced galvanized steel sheet. ["No-Coat" synthetic-reinforced trim may be used in lieu of paper-faced galvanized steel sheet for cornerbead and L-bead applications.]
 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - e. Expansion (control) joint.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 - d. Stockton Products.
 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified. Class II clear anodic finish complying with AAMA 611.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 3. Tile Backing Panels: As recommended by panel manufacturer.
- 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.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
- D. Joint Compound for Exterior Applications:
 - 1. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.
- E. Joint Compound for Tile Backing Panels:
 - 1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. 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).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 - 2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
 - b. Grabber Construction Products; Acoustical Sealant GSC.
 - c. Pecora Corporation; AC-20 FTR or AIS-919.
 - d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - e. USG Corporation; SHEETROCK Acoustical Sealant.
 - 2. 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).
- F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- G. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Install gypsum board with open horizontal joint (gap) not to exceed ½-inch above finished floor slab and tape & finish vertical joints to bottom edge of board to afford a smooth substrate for applied wall base.
- F. Form control and expansion joints with space between edges of adjoining gypsum panels.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- G. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc., except in chases braced internally).
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- H. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) 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.
- I. Isolate perimeter of gypsum board ceilings and soffits at surrounding non-gypsum board construction. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with LC-bead edge trim where edges of gypsum panels are exposed and U-bead edge trim where concealed. Seal joints between edges and surrounding non-gypsum wall surfaces with acoustical sealant.
- J. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- K. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations.
- L. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: Vertical surfaces unless otherwise indicated.
 - 2. Type X: Where required for fire-resistance-rated assembly.
 - 3. Ceiling Type: Ceiling surfaces.
 - 4. Type C: Where required for specific fire-resistance-rated assembly indicated.
 - 5. Moisture and Mold-Resistant Type: Shower system waterproof membrane wall backing.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
 2. Fasten with corrosion-resistant screws.

3.5 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and where indicated for areas indicated to receive tile.

3.6 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Principal control joint locations are indicated on Drawings. Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use where indicated.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.7 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. 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.
 3. Level 5: Provide where indicated on Drawings.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

- A. Owner will engage a qualified special inspector to conduct special inspections of gypsum fire protection.
1. Where deficiencies are found, repair or replace gypsum board assemblies to comply with requirements.
- B. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- d. Installation of air devices.
- e. Installation of mechanical system control-air tubing.
- f. Installation of ceiling support framing.

3.9 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Installation Instructions: Manufacturer's installation instructions for specified ceiling assemblies and components.
- C. Qualification Data: For testing agency.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
- E. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.
- F. Sample Warranty: For 30-year panel and grid warranty systems specified.
- G. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
 - 2. Suspension System: Obtain each type through one source from a single manufacturer.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Surface-Burning Characteristics: Ceiling panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 - 1. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Wood Ceilings--Seismic Zones 0-2."
 - 2. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 13.5.6.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 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. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 35 percent by weight.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.
- C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
- D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING – **ACP-A**

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. USG Olympia Micro ClimaPlus Item #4211
 - 2. Armstrong World Industries, Inc.; “Ultima”
 - 3. CertainTeed, Inc.; “Symphony M”
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type IV, mineral base with painted finish; Form 2, water felted.
 - 2. Pattern: E (lightly textured) or G (smooth).
- C. Color: White.
- D. LR: Not less than 0.86.
- E. NRC: Not less than 0.50
- F. CAC: Not less than 30
- G. Edge/Joint Detail: Square.
- H. Thickness: 5/8 inch.
- I. Modular Size: 24 by 24 inches.
- J. Humidity Resistant: Minimum 15-year warranty against sag.
Recycled Content: Not less than 44%

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
 - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
 - D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 - E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.
 - F. Clean-Room Gasket System: Where indicated, provide manufacturer's standard system, including manufacturer's standard gasket and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material from and maintain positive pressure in clean room.
- 2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING, ACP-A & B
- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. USG Interiors, Inc.; "Donn DX 24 System"
 - 2. Armstrong World Industries, Inc.; "Prelude XL"
 - 3. Chicago Metallic Corporation; "1200 System/211-219 Main Tee"
 - B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653, not less than G30 coating designation, with prefinished 15/16-inch-wide metal caps on flanges. Provide main beams and 48-inch length cross-tees of same depth and support load carrying capacity required for main beams for specified structural class (intermediate duty). Provide positive locking cross-tee to main beam connection and override cross-tee ends, and a bayonet type end coupling (vs. knuckle type) for main runners.
 - 1. Structural Classification: Intermediate-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Steel or aluminum cold-rolled sheet.

5. Cap Finish: Painted white.

2.5 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
- B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
 2. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
 3. Conversion-Coated Finish: AA-M12C42 (Chemical Finish: cleaned with inhibited chemicals; acid-chromate-fluoride-phosphate conversion coating).
 4. Conversion-Coated and Factory-Primed Finish: AA-M12C42R1x (Chemical Finish: cleaned with inhibited chemicals; acid-chromate-fluoride-phosphate conversion coating; organic coating as follows):
 - a. Manufacturer's standard, factory-applied prime-coat finish ready for field painting.
 5. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
 6. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; organic coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

2.6 ACOUSTICAL SEALANT

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 2. Acoustical Sealant for Concealed Joints:
 - a. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
 - b. Pecora Corporation; BA-98.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- c. Tremco, Inc.; Tremco Acoustical Sealant.
- B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- C. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), recommended for sealing interior concealed joints to reduce airborne sound transmission.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as indicated in finish schedule or directed by Architect.
 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
- 3.4 CLEANING
- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

END OF SECTION 095113

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.
- D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Source Limitations: Obtain resilient base, resilient stair accessories and resilient molding accessories through single source from single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.5 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not below 70 deg F (21 deg C) or above 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.6 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE (RB)

- A. Resilient Base:
 - 1. Available Type TP (rubber, thermoplastic) Products: Provide one of the following or alternate complying material acceptable to Architect.
 - a. Armstrong World Industries, Inc.; Rubber Coved-Toe Wall Base
 - b. Flexco (USA), Inc.; Flexco Base 2000 - Cove.
 - c. Johnsonite; Rubber Wall Base – Cove.
 - d. Mannington Commercial; Premium Edge – Coved.
 - e. Roppe Corporation; 700 Series TPR Wall Base – Style B (Cove).
- B. Resilient Base Standard: ASTM F 1861.
 - 1. Material Requirement and Manufacturing Group: Type TP (rubber, thermoplastic), Group I (solid, homogeneous) or Group II (layered).
 - 2. Style: Cove (base with toe) at VCT locations and Straight (base without toe) at CTILE locations.
- C. Minimum Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (102 mm)
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside and Inside Corners: Job formed.
- G. Finish ,Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 RESILIENT STAIR ACCESSORIES (RST/RSR)

- A. Resilient Stair Treads:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Flexco, Inc.
 - b. Johnsonite.
 - c. Mannington Commercial.
 - d. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
 - e. Roppe Corporation, USA.
 - 2. Available Products: Provide one of the following or alternate complying material acceptable to Architect.
- B. Resilient Stair Treads Standard: ASTM F 2169.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Material Requirement: Type TS (rubber, vulcanized thermoset).
2. Surface Design:
 - a. Class 2, Pattern: Raised-disc design
3. Manufacturing Method: Group 2, tread with contrasting color for the visually impaired.
- C. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
- D. Nosing Height: 1-1/2 inches (38 mm).
- E. Thickness: 1/4 inch (6 mm) and tapered to back edge.
- F. Size: Lengths and depths to fit each stair tread in one piece or, for treads exceeding maximum lengths manufactured, in equal-length units.
- G. Risers: Smooth, flat, toeless, height and length to cover risers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
 1. Thickness: 0.125 inch (3.2 mm) [0.080 inch (2.0 mm)]
- H. Stringers: Of same thickness as risers, height and length after cutting to fit risers and treads and to cover stair stringers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
- I. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 RESILIENT MOLDING ACCESSORY

- A. Resilient Molding Accessory:
 1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Flexco, Inc.
 - b. Johnsonite.
 - c. Mannington Commercial.
 - d. R.C.A. Rubber Company (The).
 - e. Roppe Corporation, USA.
 - f. VPI, LLC; Floor Products Division.
- B. Description: Include but are not limited to, reducer strip for resilient floor covering, joiner for tile and carpet, transition strips.
 1. Reducer strip for resilient flooring 1/8 inch x 1.25 inch.
 2. Transition strip for carpet 3/8" undercut, 12' sections: Flexco Edge Guard #79 or comparable.
- C. Material: Vinyl.
- D. Profile and Dimensions: As required.
- E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 SUBFLOOR LEVELING ACCESSORY

- A. Subfloor Leveling Accessory: Provide subfloor leveling system to provide smooth transition between two different flooring elevations. Leveling strips shall comply with applicable ANSI A117.1 requirements & ADA Accessibility Guidelines governing Changes in Level.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Johnsonite; "Subfloor Leveler System."
 - b. Mannington Commercial; "Subfloor Leveling System."
 - c. Roppe Corporation, USA; "Subfloor Leveler."
 - d. Flexco; "Subleveling Systems."
2. Profile: Provide as indicated, or as required for indicated transition depth.
3. Length: Provide continuous for full length of indicated transitions.
4. Adhesive: Provide manufacturer recommended adhesive for application to substrate indicated.

2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Moisture Vapor Treatment (MVT): Where resilient flooring and accessories are installed over concrete slabs, provide the following:
 1. Subject to compliance with requirements, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, and approved by the flooring manufacturer, equivalent to one of the following:
 - a. Duraamen Engineered Products, Inc.; "Perdure MVT."
 - b. Maxxon Corporation; "Maxxon MVP."
 - c. Tnemec Company, Inc.; "Epoxoprime MVT, Series 208."
 2. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer's warranty.
 3. Low-VOC: Provide product with VOC content less than 15 g/L.
 4. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
 5. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft²/in-Hg, per ASTM F 3010.
 6. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.
- C. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Cove Base Adhesives: Not more than 50 g/L.
 - b. Rubber Floor Adhesives: Not more than 60 g/L.
- D. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.
- E. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (92.9 sq. m) and perform not less than 2 tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170.
 - 5. Moisture Vapor Treatment (MVT): After initial moisture testing is complete, prepare slab and install MVT in accordance with manufacturer's written instructions. If moisture testing indicates measurements are within acceptable levels for flooring installation without need of moisture vapor treatment, MVT may be omitted where approved by the Architect.
 - a. After installation of MVT, perform final moisture tests to verify that moisture-vapor-emission rate is at an acceptable level for flooring installation. Proceed with flooring installation only after substrates demonstrate a moisture-vapor-emission rate and relative humidity not more than maximum indicated.
 - 1) Moisture-Vapor-Emission Rate: Maximum 3 lbs. of water/1,000 sq. ft. (1.36 kg of water/92.9 sq. m.) in 24 hours, unless indicated otherwise by flooring manufacturer's requirements.
 - 2) Relative Humidity: Maximum 75 percent relative humidity, unless indicated otherwise by flooring manufacturer's requirements.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.
- D. Subfloor Leveling Accessory: Butt to adjacent materials and tightly adhere leveling strips to substrate throughout length of each piece.
 - 1. At door openings, leveling strips shall be centered under doors. At cased openings, transition strips shall be centered in the frame.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
 - 1. Apply manufacturer's recommended number of coats.
- E. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Grain: The apparent direction of the printed or inherent design in a tile.
- B. Pattern: The color arrangement and/or geometric arrangement of multiple tiles on a surface.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of resilient floor tile.
 - 1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 2. Show details of special patterns.
- C. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION FLOOR TILE (VCT)

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Armstrong World Industries, Inc; Excelon.
 - 2. Johnsonite, a Tarkett Company
- B. Tile Standard: ASTM F 1066, Class 2 (through-pattern tile). Pattern and colors on the surface of the tile shall extend entirely through the thickness of the tile. Changes in the appearance of the pattern through the thickness of the tile are not acceptable. "Through-color" composition tile is not acceptable.
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch.
- E. Size: 12 by 12 inches.
- A. Colors and Patterns: As selected by Architect from full range of available colors and patterns.

2.3 RESILIENT BASE AND ACCESSORIES

- A. Refer to Division 9 Section "Resilient Base and Accessories."

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Moisture Vapor Treatment (MVT): Where resilient flooring and accessories are installed over concrete slabs, provide the following:
 - 1. Subject to compliance with requirements, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, and approved by the flooring manufacturer, equivalent to one of the following:
 - a. Duraamen Engineered Products, Inc.; “Perdure MVT.”
 - b. Maxxon Corporation; “Maxxon MVP.”
 - c. Tnemec Company, Inc.; “Epoxoprime MVT, Series 208.”
 - 2. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer’s warranty.
 - 3. Low-VOC: Provide product with VOC content less than 15 g/L.
 - 4. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
 - 5. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft²/in-Hg, per ASTM F 3010.
 - 6. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.
- C. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
 - 1. Adhesives shall comply with the following limits for VOC content:
 - a. Vinyl Composition Tile Adhesives: 50 g/L or less.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m) and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor emission rate of in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170.
5. Moisture Vapor Treatment (MVT): After initial moisture testing is complete, prepare slab and install MVT in accordance with manufacturer's written instructions. If moisture testing indicates measurements are within acceptable levels for flooring installation without need of moisture vapor treatment, MVT may be omitted where approved by the Architect.
 - a. After installation of MVT, perform final moisture tests to verify that moisture-vapor-emission rate is at an acceptable level for flooring installation. Proceed with flooring installation only after substrates demonstrate a moisture-vapor-emission rate and relative humidity not more than maximum indicated.
 - 1) Moisture-Vapor-Emission Rate: Maximum 3 lbs. of water/1,000 sq. ft. (1.36 kg of water/92.9 sq. m.) in 24 hours, unless indicated otherwise by flooring manufacturer's requirements.
 - 2) Relative Humidity: Maximum 75 percent relative humidity, unless indicated otherwise by flooring manufacturer's requirements.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles square with room axis, unless indicated otherwise.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 1. Lay out tiles with grain running in directions as follows:

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- a. Directional Grain Layout: Install tiles with grain running in the same direction, install so that grain is parallel to preponderant long walls of rooms unless indicated otherwise.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of cased openings and to center under door leafs at door openings unless indicated otherwise. Where transitions occur to another flooring material, extend or cut floor tiles to suit transition.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
 - a. Do not wash surfaces until after time period recommended by manufacturer.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply not less than three coats. Provide additional coats as required to comply with manufacturer's recommendations.
- E. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
- F. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 096519

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 096813 – TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Existing flooring materials to be removed.
 - 3. Carpet tile type, color, and dye lot.
 - 4. Type of subfloor.
 - 5. Type of installation.
 - 6. Pattern of installation.
 - 7. Pattern type, location, and direction.
 - 8. Pile direction.
 - 9. Type, color, and location of insets and borders.
 - 10. Type, color, and location of edge, transition, and other accessory strips.
 - 11. Transition details to other flooring materials.
- C. Samples: For initial selection.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.
- B. Warranty: Special warranty specified in this Section.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI Carpet Installation Standard, Section 5, "Storage and Handling."

1.7 PROJECT CONDITIONS

- A. Comply with CRI Carpet Installation Standard, Section 7 "Site Conditions – All Installations" Section 11 "Ventilation."
- B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.8 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
 - 3. Warranty Period: 15 years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to **5** percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

- 2.1 Provide Basis-of-Design carpet tile product or comparable product by one of the following, subject to acceptance by Architect:

- 1. Bentley

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Mannington Commercial
3. Tandus-Centiva

B. CARPET TILE (C-TILE) Basis of Design

1. Manufacturer: Interface Carpet
 - a. Contact: Milly Cort 704-236-3467
 - b. Product Name: "Shoreline"
 - c. Color: To be determined by Architect
 - d. Fiber Content: Universal Type 6,6 Nylon
 - e. Gauge: 1/12 in"
 - f. Stitches: 9.2 per inch
 - g. Backing: PVC Free
 - h. Size: Plank Tile 25cmx1m maximum
 - i. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Moisture Vapor Treatment (MVT): Where flooring is installed over concrete slabs, provide the following:
 1. Subject to compliance with requirements, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, and approved by the flooring manufacturer, equivalent to one of the following:
 - a. Duraamen Engineered Products, Inc.; "Perdure MVT."
 - b. Maxxon Corporation; "Maxxon MVP."
 - c. Tnemec Company, Inc.; "Epoxoprime MVT, Series 208."
 2. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer's warranty.
 3. Low-VOC: Provide product with VOC content less than 15 g/L.
 4. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
 5. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft²/in-Hg, per ASTM F 3010.
 6. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.
- C. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI Carpet Installation Standard, Section 7 "Site Conditions – All Installations," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Concrete Substrates:
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (92.9 sq. m) and perform not less than 2 tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor emission rate of in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170.
 - 5. Moisture Vapor Treatment (MVT): After initial moisture testing is complete, prepare slab and install MVT in accordance with manufacturer's written instructions. If moisture testing indicates measurements are within acceptable levels for flooring installation without need of moisture vapor treatment, MVT may be omitted where approved by the Architect.
 - a. After installation of MVT, perform final moisture tests to verify that moisture-vapor-emission rate is at an acceptable level for flooring installation. Proceed with

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

flooring installation only after substrates demonstrate a moisture-vapor-emission rate and relative humidity not more than maximum indicated.

- 1) Moisture-Vapor-Emission Rate: Maximum 3 lbs. of water/1,000 sq. ft. (1.36 kg of water/92.9 sq. m.) in 24 hours, unless indicated otherwise by flooring manufacturer's requirements.
 - 2) Relative Humidity: Maximum 75 percent relative humidity, unless indicated otherwise by flooring manufacturer's requirements.
- C. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- D. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI Carpet Installation Standard, Section 18 "Modular Carpet," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Ashlar pattern as recommended in writing by carpet tile manufacturer for specific pattern used. Long edge of tile shall run parallel with the length of the room.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings. Extend carpet tile to center of cased openings and to center under door leafs at door openings unless indicated otherwise. Where transitions occur to another flooring material, extend or cut carpet tile to suit transition.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 2. Remove yarns that protrude from carpet tile surface.
 3. Vacuum carpet tile using commercial machine with face-beater element.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Protect installed carpet tile to comply with CRI Carpet Installation Standard, Section 20 "Protection of Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

3.5 OWNER TRAINING:

- A. Instruct Owner's personnel responsible for maintaining installed carpet in accordance with manufacturer's published recommendations. Carpet manufacturer's technical representative shall conduct a training seminar for Owner's Lead of Facilities Maintenance and selected supervisors to demonstrate manufacturer's recommended cleaning, spot cleaning and preventive maintenance procedures of the installed carpet products.
 - 1. Conduct the training seminar within the Substantially Completed facility, utilizing cleaning equipment purchased by the Owner for facilities maintenance.
 - 2. Training seminar shall include both demonstrations and hands-on cleaning of the installed product(s) by Owner's personnel.
 - 3. Carpet manufacturer's technical representative shall digitally record the training seminar and furnish the Owner with two (2) copies (in DVD format) for future instruction of Facilities Maintenance personnel.

END OF SECTION 096813

SECTION 098433 - SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes shop-fabricated, fabric-wrapped panel units tested for acoustical performance, including:
 - 1. Sound-absorbing wall and ceiling mounted panels.

1.3 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.
- B. SAA: Sound Absorption Average.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of fabric facing, panel edge, core material, and mounting indicated.
- B. Shop Drawings: For sound-absorbing wall units. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials.
 - 1. Include elevations showing panel sizes and direction of fabric weave and pattern matching.
- C. Samples for Initial Selection: color chart representing each type of fabric facing from sound-absorbing wall unit manufacturer's full range.
- D. Samples for Verification: For the following products, prepared on Samples of size indicated below:
 - 1. Fabric: Full-width by approximately **36-inch- (900-mm-)** long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
 - 2. Core Material: **12-inch- (300-mm-)** square Sample at corner.
 - 3. Mounting Devices: Full-size Samples.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Electrical outlets, switches, and thermostats.
 - 2. Items penetrating or covered by sound-absorbing wall units including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- d. Alarms.
- e. Sprinklers.
- f. Access panels.

B. Product Certificates: For each type of sound-absorbing wall unit, from manufacturer.

C. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sound-absorbing wall units to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain sound-absorbing wall units from single source from single manufacturer.

B. Fire-Test-Response Characteristics: Provide sound-absorbing wall units meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.

a. Flame-Spread Index: 25 or less.

b. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 and 286.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.

1. Build mockup of typical wall area[as shown on Drawings] [as directed by Architect] <Insert requirement>.[Include intersection of wall and ceiling, corners, and perimeters.]

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

D. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and sound-absorbing wall unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.9 PROJECT CONDITIONS

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

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Lighting: Do not install sound-absorbing wall units until a lighting level of not less than 50 fc (538 lux) is provided on surfaces to receive the units.
- C. Air-Quality Limitations: Protect sound-absorbing wall units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify locations of sound-absorbing wall units and actual dimensions of openings and penetrations by field measurements before fabrication.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sound-absorbing wall units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to the following:
 - a. Acoustical performance.
 - b. Fabric sagging, distorting, or releasing from panel edge.
 - c. Warping of core.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOUND-ABSORBING WALL UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
- B. Products: Available products include the following:
 - 1. APS-R, Acoustical Panel Systems, Inc. (APS) www.acpansys.com
 - 2. AlphaSorb, Acoustical Solutions, Inc. www.acousticalsolutions.com
 - 3. AP Acoustics Panel, Decoustics Ltd www.decoustics.com
 - 4. Acous Tech, AVL Systems, Inc. www.avlonline.com
 - 5. PS 80 Panel, Panel Solutions, Inc. www.panelsolutions.com
 - 6. Soundsoak, Armstrong www.armstrong.com/soundsoak
 - 7. Golterman & Sabo www.golterman.com
- C. General Requirements for Sound-Absorbing Wall Units: Units 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. Sound-Absorbing Wall Panel: Manufacturer's standard panel construction consisting of facing material stretched over front face of edge-framed core and bonded or attached to edges and back of frame.
 - 1. Mounting: Edge mounted with splines secured to substrate.
 - a. Finish Color at Exposed Edges: Match color of facing material.
 - 2. Mounting: Back mounted with manufacturer's standard metal clips or bar hangers for secured to substrate.
 - 3. Core: Manufacturer's standard glass-fiber board.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- a. Core-Face Layer: Manufacturer's standard sheet
- 4. Edge Construction: Manufacturer's standard chemically hardened core with no frame.
- 5. Edge Profile: Eased (small radius)
- 6. Corner Detail in Elevation: Eased (small radius) with continuous edge profile indicated.
- 7. Acoustical Performance: Sound absorption NRC of not less than 0.95 according to ASTM C 423 for Type A mounting according to ASTM E 795.
- 8. Nominal Overall Panel Thickness: 2 inches (51 mm)
- 9. Panel Width: As indicated on Drawings
- 10. Panel Height: As indicated on Drawings

2.2 MATERIALS

A. General:

- 1. Minimum Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent by weight.
- 2. Regional Materials: Sound-absorbing wall units shall be manufactured within 500 miles (800 km) of Project site.
- 3. Certified Wood: Fabricate products with wood-based components produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Core Materials:

- 1. Glass-Fiber Board: ASTM C 612, Type standard with manufacturer; nominal density of [6 to 7 lb/cu. ft. (96 to 112 kg/cu. m)] unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

C. Facing Material Fabric from same dye lot; color and pattern as selected by Architect from manufacturer's full range

- 1. Manufacturer: Guilford of Maine
- 2. Product Line/Pattern: Anchorage
- 3. Style Number: Selected by Architect from manufacturer's full range
- 4. Color: Selected by Architect from manufacturer's full range
- 5. Fiber Content: 100 percent woven polyester
- 6. Width: 66 inches (1676 mm)

D. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit, and as follows:

- 1. Impaling Clips: Ceiling mounted panels only
- 2. Metal Clips or Bar Hangers: Manufacturer's standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of unit and the other part to substrate, designed to permit unit removal.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.3 FABRICATION

- A. General: Use manufacturer's standard construction except as otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
 - 1. [Glass-Fiber Board] [and] [Mineral-Fiber Board] Cores: Chemically harden core edges and areas of core where mounting devices are attached.
- B. Core-Face Layer: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.
- C. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
 - 1. Radius and Other Nonsquare Corners: Attach facing material so there are no seams or gathering of material.
 - 2. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent units.
- D. Dimensional Tolerances of Finished Units: Plus or minus **1/16 inch (1.6 mm)** for the following:
 - 1. Thickness.
 - 2. Edge straightness.
 - 3. Overall length and width.
 - 4. Squareness from corner to corner.
 - 5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabric, fabricated units, substrates, areas, and conditions, for compliance with requirements, installation tolerances, and other conditions affecting performance of sound-absorbing wall units.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install sound-absorbing wall units in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with sound-absorbing wall unit manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.
- C. Align and level fabric pattern and grain among adjacent units.

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus **1/16 inch (1.6 mm)**

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098433

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

SECTION 099100 – PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DESCRIPTION OF WORK:

- A. Extent of painting work is indicated on drawings and schedules, and as herein specified.
- B. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout Project, except as otherwise indicated.
1. Identification of fire- and smoke-rated walls: Provide markings and identification in accordance with the applicable building code requirements, including NCBC, Section 703.6.
 2. Identification of fire- and smoke-rated walls: At fire-rated and smoke-rated walls, provide 1-inch high painted stencil lettering above finished ceilings and on the inside of ceiling access doors which provide access to such walls. Locate lettering at 8'-0" maximum horizontal intervals on both sides of concealed walls. Lettering shall be in all capital letters, in fluorescent "safety orange" paint color, stating description of fire-rated wall assembly and hourly rating
 - a. Provide descriptions as applicable in the following format, substituting actual hour rating and type for sample rating and type:
 - 1) ONE HOUR FIRE BARRIER.
 - 2) ONE-HALF HOUR FIRE PARTITION.
 - 3) THREE HOUR FIRE WALL.
 - 4) ONE HOUR SMOKE BARRIER.
 - b. For incidental accessory use separations, provide the following:
 - 1) SMOKE-RESISTANT PARTITION.
 - c. Do not provide lettering at rated wall that are exposed to view (that is, in spaces without dropped ceilings).
 - d. Refer to the Life Safety Plans and Partition types for rated wall locations; and reflected ceiling plans for concealed rated wall locations.
 3. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
 4. Painted Patterns and Accent Colors: Location of multi-color paint patterns and accent color areas are indicated in "Interior Accent Paint Color Schedule" on Drawings.
- C. Work includes field painting of exposed bare and covered pipes and ducts, and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work. (Labeling on pipes and ducts, including possible stencil lettering, is included in Division 21, 22 and 23 work.) Exposed to view ductwork shall be painted an accent color.
- D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers, fillers, & other applied materials whether used as prime, intermediate or finish coats.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- E. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules." Where items or surfaces are not specifically mentioned to be painted, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finishes available.
 - F. Following categories of work are not included as part of field-applied finish work.
 - 1. Pre-Finished Items: Unless otherwise indicated, do not field-paint items specified for factory- or installer-finishing; such as toilet enclosures, acoustic materials, architectural woodwork, mechanical and electrical equipment, switchgear and distribution cabinets.
 - 2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, and pipe spaces, and elevator and duct shafts.
 - 3. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
 - 4. Operating Parts: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts will not require finish painting.
 - G. Following categories of work are included under other sections of these specifications.
 - 1. Shop Primers: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
 - 2. Unless otherwise specified, shop priming of fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of these specifications.
 - H. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates. Do not paint over fire alarm devices, sprinklers and similar fire safety devices.
- 1.3 QUALITY ASSURANCE:
- A. Single Source Responsibility: Provide primers, other undercoat paint, and finish coat products produced by same manufacturer for each paint system. Use only thinners approved by paint manufacturer, and use only within recommended limits.
 - B. Coordination of Work: Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.
 - 1. Test primers, bonding primers and coating products for compatibility and adhesion to existing substrates.
 - C. Field Samples: On designated wall surfaces and other interior components, duplicate finishes of prepared samples. Provide full-coat finish samples on at least 100 sq. ft. of surface until required sheen, color and texture are obtained; simulate finished lighting conditions for review of in-place work.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Water-Borne Epoxy Enamel System: Prior to providing 100 sq. ft. sample area on CMU substrate, conduct a Preinstallation Conference for water-borne epoxy enamel system including the Contractor, painting subcontractor, coating system manufacturer's representative, and Architect to establish preparation, material application methods, film thickness, and inspection requirements.
- D. Color Selection Sample Areas: Architect will designate required field sample area colors and locations when color schedule is issued. Final acceptance of those colors will be from job-applied samples.
- E. All paint materials and workmanship are subject to a 2 year (24 months) period from the date of Final Acceptance or Substantial Completion (whichever occurs first), as noted in the General Conditions.

1.4 SUBMITTALS:

- A. Inspection Report: Paint manufacturer's technical representative will inspect existing facility to confirm the existing paint systems, and note substrates which require bond or barrier coating to render them compatible with specified paint systems. Submit copy of report to Architect.
 1. Inspector shall identify MPI DSD 3 Degree of Surface Degradation surfaces ("severely deteriorated paint") recommended to have paint film completely removed.
- B. Product Data: Submit manufacturer's technical information including Paint label analysis and application instructions for each material proposed. Include paint system schedule in the format used in this specification section.
 1. For DTM enamel and water-borne epoxy enamel products, provide the following performance data.
 - a. Abrasion Resistance test data per ASTM D4060 with CS-17 wheel, 1000 gram load for 1000 cycles. (CS-10 wheel data not acceptable).
 - b. Direct Impact Resistance test data per ASTM D2794.
 - c. Adhesion test data per ASTM D4541.
- C. Color Chips: Submit color chips of manufacturer's *complete range of colors* for each paint type for Architect's review of color and texture (sheen). These will be used for initial color selection if the submitted range is adequate.
 1. Based on products of the selected manufacturer and paint systems specified in this Section, the Architect will prepare an initial color schedule indicating paint colors to be used in each space. The Architect will indicate required colors by referencing the selected paint manufacturer's color chips, or by referencing drawdowns or other standard (such as "match laminate color").
 2. Provide 8-1/2 x 11 inch color samples ("drawdowns") for all paint colors and sheens for which the color in Architect's color schedule is not indicated by colors of the selected paint manufacturer for approval prior to application in the field. Provide paint drawdowns in finish sheens applicable to those in the field.

1.5 DELIVERY AND STORAGE:

- A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
 1. Name or title of material.
 2. Manufacturer's stock number and date of manufacture.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3. Manufacturer's name.
 4. Contents by volume, for major pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.
- C. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take precautions to ensure workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.
- 1.6 JOB CONDITIONS:
- A. Apply paints only when temperature of surfaces to be painted and surrounding air are between 50°F and 90°F for water-base paints; and between 45°F and 95°F for solvent-thinned paints, unless otherwise permitted by paint manufacturer's printed instructions.
- B. Do not paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.
1. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature and humidity limits specified by paint manufacturer during application and drying periods.
- C. Wind: Do not spray coatings if wind velocity exceeds manufacturer's recommended limit.
- D. Ventilation: Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with manufacturer's instructions.
- E. Dust and Contaminants:
1. Schedule coating work to avoid excessive dust and airborne contaminants.
 2. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Paint Manufacturer: Subject to compliance with requirements, provide products of one of the following:
1. Benjamin Moore and Co. (Ben Moore).
 2. PPG Architectural Coating/PPG Paints (PPG).
 3. Sherwin-Williams Co. (S-W).
- B. Special Coatings Manufacturer: Subject to compliance with requirements, provide moisture curing aliphatic urethane coating system products of one of the following or prequalified other manufacturer:
1. Benjamin Moore and Co. (Ben Moore).
 2. PPG Architectural Coating/PPG Paints (PPG).
 3. Sherwin-Williams Company (S-W).

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2.2 MATERIALS:

- A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
- B. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated. Lead content in pigment, if any, is limited to contain not more than 0.06% lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been correct in a manner acceptable to Applicator.
- B. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
- C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.2 SURFACE PREPARATION:

- A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
- 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. Cleaning: Before applying paint or surface treatments, clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove oil and grease prior to mechanical cleaning.
 - 2. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
 - 3. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- D. Surface Preparation of Previously Painted [Hard Surfaces] [CMU and Steel Doors and Frames]: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Test all remaining previously painted substrates for adhesion of the current coating systems using physical testing procedure ASTM D 3359 (Measuring Adhesion by Tape).
 - 2. If indicated by testing remove all layers of poorly adhering coatings from previously coated substrates.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3. Abrade tightly adhering previously coated/ painted substrates to provide a sufficient surface profile for new coatings systems.
 4. Provide barrier primers and/or bonding primers over prepared previously coated substrates and previously coated tightly adhering coating systems on all substrates.
- E. Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.
1. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
- F. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, suitable solvent, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
1. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.
 2. When transparent finish is required, use specified sealer (varnish) for backpriming.
- G. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
1. Touch-up shop-applied prime coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.
- H. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent. Provide wash coat if required by paint system manufacturer for prepared substrate.
- 3.3 SURFACE-PREPARATION SCHEDULE FOR PREVIOUSLY PAINTED SURFACES
- A. General: Before painting, prepare surfaces for painting according to applicable requirements specified in this schedule.
1. Examine surfaces to evaluate each surface condition according to the paragraphs below.
 2. Where existing degree of soiling prevents examination, preclean surface and allow it to dry before making an evaluation.
- B. Surface Preparation for MPI DSD 0 Degree of Surface Degradation:
1. Surface Condition: Existing paint film in good condition and tightly adhered.
 2. Paint Removal: Not required.
 3. Preparation for Painting: Wash surface by detergent cleaning; use solvent cleaning where needed. Roughen or degloss cleaned surfaces to ensure paint adhesion according to paint manufacturer's written instructions.
- C. Surface Preparation for MPI DSD 1 Degree of Surface Degradation:
1. Surface Condition: Paint film cracked or broken but adhered.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Paint Removal: Scrape by hand-tool cleaning methods to remove loose paint until only tightly adhered paint remains.
3. Preparation for Painting: Wash surface by detergent cleaning; use other cleaning methods for small areas of bare substrate if required. Roughen, degloss, and sand the cleaned surfaces to ensure paint adhesion and a smooth finish according to paint manufacturer's written instructions.

D. Surface Preparation for MPI DSD 2 Degree of Surface Degradation:

1. Surface Condition: Paint film loose, flaking, or peeling.
2. Paint Removal: Remove loose, flaking, or peeling paint film by hand-tool or chemical paint-removal methods.
3. Preparation for Painting: Wash surface by detergent cleaning; use solvent cleaning where needed. Use other cleaning methods for small areas of bare substrate if required. Sand surfaces to smooth remaining paint film edges. Prepare bare cleaned surface to be painted according to paint manufacturer's written instructions for substrate construction materials.

E. Surface Preparation for MPI DSD 3 Degree of Surface Degradation:

1. Surface Condition: Paint film severely deteriorated, obscuring fine architectural detail work because of paint-layer buildup and / or surface indicated in paint manufacturer's technical representative's inspection report to have paint completely removed.
2. Paint Removal: Completely remove paint film by hand-tool or chemical paint-removal methods. Remove rust.
3. Preparation for Painting: Prepare bare cleaned surface according to paint manufacturer's written instructions for substrate construction materials.

3.4 MATERIALS PREPARATION:

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Maintain paint mixing and application containers in a clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.5 APPLICATION:

- A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
 1. Provide access to representative of selected coating manufacturer for observation of material application only at all times during painting work. Unless specifically indicated by Architect, this representative shall have no authority to make decisions about the work.
 2. Paint surface treatments and finishes are indicated in "schedules" of Contract Documents.
 3. Provide finish coats that are compatible with prime paints used.
 4. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Ensure that

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- surfaces, including edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
5. Paint surfaces behind movable and permanently fixed equipment and furniture.
 6. Paint duct interior surfaces visible through registers or grilles, with flat, non-specular black paint.
 7. Paint back sides of access panels, and removable or hinged covers.
 8. Finish exterior and interior doors on tops, bottoms and side edges same as faces.
 9. Sand lightly between each succeeding enamel or varnish coat.
 10. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless required to prevent "show-through" for finish topcoats.
- B. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish total DFT indicated or as recommended by coating manufacturer.
- D. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces. Do not paint prefinished equipment items unless directed otherwise.
- E. Prime Coats: Apply prime coat to material which is required to be painted or finished, and which has not been prime coated by others. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- F. Finish Coats: Provide finish quality for new and repainted surfaces as follows:
1. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
 2. Transparent (Clear) Finish: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats, unless otherwise noted.
- G. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.
- H. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3.6 CLEAN-UP AND PROTECTION:

- A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or damage finished surfaces.
- B. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work until date of Substantial Completion. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
 - 1. Provide "Wet Paint" signs to protect newly-painted finishes. Remove temporary protective wrappings provided by others for their work after completion of painting.
 - 2. At completion of work of other trades, touch-up & restore all damaged painted surfaces.

3.7 EXTERIOR PAINT SCHEDULE:

- A. General: Provide the following Paint systems for the various substrates, as indicated.
- B. Field-Applied Coatings for Ferrous Metal (AESS): Aliphatic urethane system of intermediate coat and topcoat. Provide scheduled products for exposed steel fabrications indicated.
 - 1. Field Touch-up: Match moisture curing urethane zinc-rich shop primer.
 - 2. Intermediate Coat: Moisture curing urethane and micaceous iron oxide or epoxy.
 - Corotech (Ben Moore): V160 Epoxy Mastic Coating
 - PPG 95-245 Pitt-Guard Rapid Coat D-T-R Epoxy Coating
 - S-W: Macropoxy 646 Fast Cure Epoxy, B58-600/B58v600
 - 3. Top Coat: Aliphatic urethane at 2.0 – 3.0 mils DFT
 - Corotech (Ben Moore): V500 Aliphatic Acrylic Urethane – Gloss
 - PPG 95-812 Pitthane Ultra Gloss Urethane Enamel
 - S-W: Corothane I Aliphatic Finish Coat B65
 - S-W: B65-300 Series/B60V30 Hi-Solids Polyurethane

3.8 INTERIOR PAINT SCHEDULE:

- A. General: Provide the following paint systems for the various substrates, as indicated. Dry film thickness is noted as "DFT." Provide compatibility test areas on existing painted substrates.
- B. Concrete Masonry Units: Low-VOC Acrylic Semi-Gloss Finish. 2 Coats over filler, with total DFT not less than 2.5 mils. (Provide for CMU except where "epoxy finish" is indicated.)
 - 1. Filler Coat, 100% Acrylic. Apply at a rate to ensure complete coverage. Brush, spray or roller apply and back roll or squeegee for smooth, pinhole-free treatment.
 - Ben Moore: 571 Ultra Spec Hi-Build Masonry Block Filler
 - PPG 16-90 Pitt Glaze WB Acrylic Interior Exterior Block Filler.
 - S-W: B42W46 Heavy Duty Block Filler
 - 2. Bonding Primer (previously painted): Acrylic bonding primer for exceptional adhesion. Test for adhesion. Brush, spray or roller apply and back roll.
 - Ben Moore/Insul-X: Stix Bonding Primer.
 - PPG: 17-921 PPG Seal Grip Acrylic Universal Primer/Sealer
 - S-W: B51W150 Extreme Bond Interior/Exterior Primer
 - Ben Moore: N376 Eco SpecWB Zero VOC Interior Semi-Gloss

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- PPG 9-500 Pure Performance Interior Semi-Gloss Latex
S-W: B10 Harmony Low Odor Interior Latex Semi-Gloss
3. First & Second Finish Coats: Commercial Interior Low-VOC Acrylic Semi-gloss Finish. Provide for wall finishes unless indicated otherwise.
- Ben Moore: N539 Ultra Spec 500 Interior Semi-Gloss Finish
PPG 6-4500 Speedhide Zero VOC Interior Semi-Gloss Latex
S-W: B31-2600 ProMar 200 Zero VOC Interior Latex Semi-Gloss
- C. Concrete Masonry Units - Semi-Gloss Water-Borne Epoxy Finish (EPX): 2 Coats over filler:
1. Block Filler Coat: Acrylic-latex or as required by manufacturer for topcoat. Brush, spray or roller apply and back roll for smooth pinhole-free treatment.
- Ben Moore: 571 Ultra Spec Hi-Build Masonry Block Filler
PPG: 6-15 Speedhide Int/Ext Acrylic Masonry Block Filler
PPG: 16-90 Pitt-Glaze WB Int/Ext Block Filler Latex
S-W: B42W46 Heavy Duty Interior/Exterior Block Filler.
2. First and Second Coats: Two-component, semi-gloss water-borne epoxy enamel applied at a DFT of 1.5 to 4.0 mils per coat. **Polyamide-epoxy.**
- Corotech (Ben Moore): V400 Polyamide Epoxy Coating
PPG: 98-100 Aquapon WB Water Base Epoxy – Semi-Gloss
S-W: B73V300 Pro Industrial Water Based Catalyzed Epoxy Hardener
- D. Gypsum Board Systems with Latex Finish: Semi-gloss finish at walls, and flat finish on ceilings except as noted. Provide best commercial Low-VOC formulation with 0 VOC per EPA test method 24.
1. Filler Coat: 0 VOC (per EPS test method 24) Latex Primer
- Ben Moore: 534 Ultra Spec 500 Primer Flat
PPG: 6-4900 Speedhide Zero VOC Interior Latex Primer
S-W: B28-2600 ProMar 200 Zero VOC Interior Latex Primer
2. First & Second Finish Coats: Interior Low-VOC Acrylic Flat Finish. Provide for ceiling and private office applications unless indicated otherwise.
- Ben Moore: 536 Ultra Spec 500 Flat
PPG: 6-4100 Speedhide Zero VOC Interior Latex Flat
S-W: B30-2600 ProMar 200 Zero VOC Interior Latex Flat
3. First & Second Finish Coats: Interior Low-VOC Acrylic Semi-Gloss Finish. Provide for wall finishes unless indicated otherwise.
- Ben Moore: N539 Ultra Spec 500 Interior Semi-Gloss Finish
PPG: 6-4500 Speedhide Zero VOC Interior Semi-Gloss Latex
S-W: B31-2600 ProMar 200 Zero VOC Interior Latex Semi-Gloss
- E. Gypsum Board Systems with Water-Borne Polyamide Epoxy Finish (“EPX”):
1. Filler Coat: Manufacturer’s recommended primer.
- Ben Moore: 253 Super Spec Latex Enamel Undercoater & Primer Sealer
PPG: 6-2 Speedhide Interior Latex Sealer
S-W: B28W2600 ProMar 200 Zero VOC Primer
2. First and Second Coats: Two-component, water-borne polyamide epoxy applied at DFT of 1.5 - 4.0 mils per coat. Provide semi-gloss finish unless directed otherwise.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

Ben Moore: P42 Super Spec HP Waterborne Polyamide Epoxy Gloss Coating
PPG: 98-100 Aquapon WB Water Base Epoxy – Semi-Gloss
S-W: B70V300 Water Based Catalyzed Epoxy Hardener

- F. Ferrous Metal: Semi-Gloss Direct to Metal (“DTM”) Acrylic Enamel Finish: 2 Coats over primer, with total DFT not less than 5.0 mils.
1. Prime Coat: Lead-free, acrylic Base Primer. Not required on shop primed items.
Ben Moore: HP29 Ultra Spec HP DTM Acrylic Semi-Gloss
PPG: 90-712 Pitt-Tech Int/Ext Primer/Finish Industrial Enamel
S-W: B66 W1 DTM Acrylic Primer/Finish (or B66 W200)
 2. Bonding Primer (previously painted): Acrylic bonding primer designed for previously painted ferrous metal to ensure secure bond. Brush, spray or roller apply and back roll.
Ben Moore/Insl-x 110 Stix Bonding Primer
PPG: 90-912 Pitt-Tech Plus DTM Industrial Primer
S-W: B66A50 DTM Bonding Primer
 3. First and Second Coat: DTM Acrylic Semi-Gloss Enamel. (30-40 units @ 60°)
Ben Moore: HP29 Ultra Spec HP DTM Acrylic Semi-Gloss
PPG: 90-1210 Pitt-Tech Int/Ext Semi-Gloss DTM Industrial Enamel
S-W: B66W1150 Series Pro Industrial DTM Acrylic Semi-Gloss Coating
- G. Zinc-Coated Metal: Semi-Gloss Direct to Metal (“DTM”) Acrylic Enamel Finish: 2 Coats over primer, with min. total DFT of 2.5 mils.
1. Prime Coat: Lead-free, acrylic base interior galvanized metal primer, premium grade.
Ben Moore: HP04 Ultra Spec HP Acrylic Metal Primer
PPG: 90-712 Pitt-Tech Int/Ext Primer/Finish Industrial Enamel
S-W: B66W1150 Series Pro Industrial DTM Acrylic Semi-Gloss Coating
 2. First and Second Coats: DTM Acrylic Semi-Gloss Enamel. Same as for ferrous metal.

END OF SECTION 099100

SECTION 101400 – SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for signs.
 - 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 2. Signage schedule (sign types) showing typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
 - 3. Message schedule as approved by the Owner.
 - 4. Floor plans showing locations of signs as approved by the Owner, corresponding to the Signage Schedule and Owner-approved Message Schedule.
- C. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
 - 1. Plaque Casting: 6 inches (150 mm) square including border.
 - 2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter, number, and graphic element). Show character style, material, finish, and method of attachment.
 - 3. Panel Signs: Full-size Samples of each type of sign required.
 - 4. Approved samples will not be returned for installation into Project.
- D. Signage Schedule: Use same designations indicated on Drawings.
- E. Qualification Data: For Installer.
- F. Maintenance Data: For signs to include in maintenance manuals.
- G. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- C. Regulatory Requirements: Comply with applicable provisions in the Department of Justice 2010 ADA Standards for Accessible Design.
 - 1. For additional signs not included in the Standards, comply with ICC/ANSI A117.1 - 2009.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

2. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
 - a. Tactile Exit Signs.
 - b. Stairway Identification.
 - c. Maximum Occupancy Signs.
 - d. Elevator Fire Emergency Signs.
 - e. Accessible Spaces.
 - f. Directional Signs.
 - g. Permanent Room Identifications.
 - h. Floor Level Signs.
3. Related Code Signage Sections:
 - a. Illuminated Exit Signs: Refer to Division 26.
 - b. Illuminated Directional Signs: Refer to Division 26.
 - c. Identification of Fire- and Smoke-Rated Walls: Refer to Division 9 Section "Painting."

1.4 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.5 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Deterioration of polymer finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image color and sign lamination.
 2. Warranty Period: Five years from date of Substantial Completion.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:
1. Impact Resistance: 16 ft-lbf/in. (854 J/m) per ASTM D 256, Method A.
 2. Tensile Strength: 9000 lbf/sq. in. (62 MPa) per ASTM D 638.
 3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. (2345 MPa) per ASTM D 790.
 4. Heat Deflection: 265 deg F (129 deg C) at 264 lbf/sq. in. (1.82 MPa) per ASTM D 648.
 5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.
- B. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils (0.076 mm) with pressure-sensitive adhesive backing, suitable for exterior applications.

2.2 PLAQUES

- 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. Advance Corporation; Braille-Tac Division.
 2. A. R. K. Ramos.
 3. Gemini Incorporated.
 4. Matthews International Corporation; Bronze Division.
 5. Metal Arts; Div. of L&H Mfg. Co.
 6. Mills Manufacturing Company.
 7. Nelson-Harkins Industries.
 8. Southwell Company (The).

2.3 DIMENSIONAL CHARACTERS

- 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. A. R. K. Ramos.
 2. ASI-Modulex, Inc.
 3. Charleston Industries, Inc.
 4. Gemini Incorporated.
 5. Innerface Sign Systems, Inc.
 6. Metal Arts; Div. of L&H Mfg. Co.
 7. Mills Manufacturing Company.
 8. Mohawk Sign Systems.
- B. Cutout Characters: Provide characters with square-cut, smooth edges. Comply with the following requirements:
1. Acrylic: 0.25 inch (6.35 mm)

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- a. Custom Paint Colors: Match Pantone color matching system.
 - b. Color(s): As selected by Architect from manufacturer's full range.
- C. Dimensional Character Sign Schedule:
 - 1. Sign Type; refer to signage details
 - a. Sign Size: As indicated
 - b. Character Size: As indicated
 - c. Text/Message: As indicated
 - d. Location: As indicated
 - e. Room: As indicated

2.4 PANEL SIGNS

- 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. Acorn Sign Graphics.
 - 2. Allen Industries Architectural Signage
 - 3. APCO Graphics, Inc.
 - 4. ASI-Modulex, Inc.
 - 5. Best Sign Systems Inc.
 - 6. Gemini Incorporated.
 - 7. Innerface Sign Systems, Inc.
 - 8. InPro Corporation
 - 9. Matthews International Corporation; Bronze Division.
 - 10. Mohawk Sign Systems.
 - 11. Nelson-Harkins Industries.
 - 12. Seton Identification Products.
 - 13. Supersine Company (The)
- B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus **1/16 inch (1.5 mm)** measured diagonally from corner to corner, complying with the following requirements:
 - 1. Phenolic-Backed Photopolymer Sheet: Provide light-sensitive, water-wash photopolymer face layer bonded to a phenolic base layer to produce a composite sheet with overall, face layer, and base-layer thicknesses, respectively, of **0.160, 0.040, and 0.120 inch (4.06, 1.0, and 3.04 mm)**.
 - a. Available Product: Subject to compliance with requirements, a product that may be incorporated into Work includes, but is not limited to, "Jet-388 (1/8-inch) Phenolic Interior Signage" by JetUSA.
 - 2. PETG-Backed Photopolymer Sheet: Provide light-sensitive, water-wash photopolymer face layer bonded to PETG base layer to produce a composite sheet with overall, face layer, and base-layer thicknesses, respectively, of **0.120, 0.040, and 0.080 inch (3.0, 1.0, and 2.03 mm)**.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- a. Available Product: Subject to compliance with requirements, a product that may be incorporated into Work includes, but is not limited to, "NovAcryl PT Series Interior Signage" by Nova Polymers.
 3. Edge Condition: **Beveled**
 4. Corner Condition: **Square**
 5. Mounting: Unframed
 6. Custom Paint Colors: Match Pantone color matching system.
 7. Color: As selected by Architect from manufacturer's full range.
 8. Tactile Characters: Characters and Grade 2 Braille raised **1/32 inch (0.8 mm)** above surface with contrasting colors.
- C. Exterior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus **1/16 inch (1.5 mm)** measured diagonally from corner to corner, complying with the following requirements:
1. Aluminum Sheet: **0.050 inch (1.27 mm)** thick.
 2. Edge Condition: Bullnose.
 3. Corner Condition: Rounded to radius indicated.
 4. Mounting: Unframed
 - a. Wall mounted.
 - b. Manufacturer's standard noncorroding anchors for substrates encountered.
 5. Custom Paint Colors: Match Pantone color matching system.
 6. Color: As selected by Architect from manufacturer's full range.
- D. Panel Sign Frames:
1. PVC Frames: Extruded, high-impact PVC plastic.
 - a. Color: As selected by Architect from manufacturer's full range
 - b. Depth: As indicated
 - c. Profile: Square
 - d. Corner Condition: Square
 - e. Mounting: As indicated.
 - 1) Wall and two-face tape.
 - 2) Manufacturer's standard noncorroding anchors for substrates encountered.
- E. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of transparent covers with paper inserts printed by Owner
- F. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with Accessibility Guidelines. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
1. Panel Material: Photopolymer.
 2. Raised-Copy Thickness: Not less than **1/32 inch (0.8 mm)**.
 3. Clearance: Maintain a minimum of 3/8-inch (9.5 mm) clearance between Braille and any surrounding raised areas.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- G. Subsurface Copy: Apply minimum ~~4-mil-~~ (0.10-mm-) thick vinyl copy to back face of clear acrylic sheet forming panel face to produce precisely formed opaque image. Image shall be free of rough edges.
- H. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of ~~3 mils~~ (0.076 mm) with pressure-sensitive adhesive backing. Apply copy to glass
 - 1. Panel Material: [Opaque acrylic sheet] [Clear acrylic sheet with opaque color coating, subsurface applied].
- I. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for five years for application intended.
 - 1. Custom Paint Colors: Match Pantone color matching system.
 - 2. Color: As selected by Architect from manufacturer's full range.

2.5 ACCESSORIES

- A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.6 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.
 - 1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
 - 2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
 - 3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
 - 4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ACRYLIC SHEET FINISHES

- A. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items , including anchor inserts are sized and located to accommodate signs.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Wall-Mounted Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls, to the right of the right hand door for double active doors. Locate tactile signs to maintain a clear space beyond swing of door, centered on and in front of each sign, of 18 inches by 18 inches.
- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
 - 1. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
 - 2. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
 - 3. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.
- C. Bracket-Mounted Signs: Provide manufacturer's standard brackets, fittings, and hardware for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- D. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
 - 1. Flush Mounting: Mount characters with backs in contact with wall surface.
 - 2. Projected Mounting: Mount characters at projection distance from wall surface indicated.
 - 3. Double Rail Mounting: Mount aluminum characters to double aluminum rail with black enamel [anodized] finish. Drill and tap characters and back mount to rail with stainless steel screws.
 - 4. Bottom Rail Mounting: Mount aluminum characters to aluminum C-channel rail with black enamel [anodized] finish. Drill and tap characters with flattened base for bottom mounting, and bottom mount to aluminum rail with stainless steel screws.
 - 5. Bottom Stud Mounting (No Rail): Drill and tap characters with flattened base for bottom mounting, and bottom mount to rail with stainless steel screws. Provide tiebacks as required by manufacturer for character heights indicated.
 - a. Galvanized and painted steel mounting rail assembly is indicated on Drawings.
- E. Cast-Metal Plaques: Mount plaques using standard fastening methods to comply with manufacturer's written instructions for type of wall surface indicated.
 - 1. Concealed Mounting: Mount plaques by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting cement.
 - 2. Face Mounting: Mount plaques using exposed fasteners with rosettes attached through face of plaque into wall surface.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 101400

SECTION 102600 - WALL PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Corner guards.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.
- B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.
- C. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated.
 - 1. Include similar Samples of accent strips and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Corner Guards: 12 inches (300 mm) long. Include examples of joinery, corners, [end caps,] [top caps,] and field splices.
- E. Material Certificates: For each impact-resistant plastic material, from manufacturer.
- F. Material Test Reports: For each impact-resistant plastic material.
- G. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.
- H. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Division 01 Section "Quality Requirements."

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
 - D. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.
 - E. Preinstallation Conference: Conduct conference at Project site.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
 2. Keep plastic sheet material out of direct sunlight.
 3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).
 - a. Store corner-guard covers in a vertical position.
- 1.6 PROJECT CONDITIONS
- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.
- 1.7 WARRANTY
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of plastic and other materials beyond normal use.
 2. Warranty Period: Five years from date of Substantial Completion.
- 1.8 EXTRA MATERIALS
- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 4-foot- (1.2-m-) long units.
 - B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

PART 2 - PRODUCTS

2.1 MATERIALS

- A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout material, thickness as indicated.
 - 1. Self-extinguishing when tested according to ASTM D 635.
 - 2. Flame-Spread Index: 25 or less.
 - 3. Smoke-Developed Index: 450 or less.
- B. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in **ASTM B 221 (ASTM B 221M)** for Alloy 6063-T5.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M.
- D. Solid Wood: Clear hardwood lumber of species indicated, free of appearance defects, and selected for compatible grain and color.
- E. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

2.2 CORNER GUARDS

- A. Surface-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
 - 1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
 - a. American Floor Products Co., Inc.
 - b. Arden Architectural Specialties, Inc.
 - c. Balco, Inc.
 - d. Construction Specialties, Inc.
 - e. IPC Door and Wall Protection Systems; Division of InPro Corporation.
 - f. Korogard Wall Protection Systems; a division of RJF International Corp.
 - g. Musson Rubber Company.
 - h. Pawling Corporation.
 - i. Tepromark International, Inc.
 - j. WallGuard.com.
 - 3. Cover: Extruded rigid plastic, minimum **0.100-inch (2.5-mm)**
 - a. Profile: Nominal **3-inch- (75-mm-)** long leg and **1/4-inch (6-mm)** corner radius
 - b. Height: **5 feet**
 - c. Color and Texture: As selected by Architect from manufacturer's full range.
 - 4. Retainer: Minimum **0.060-inch- (1.5-mm-)** thick, one-piece, extruded aluminum
 - 5. Retainer Clips: Manufacturer's standard impact-absorbing clips.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

6. Top and Bottom Caps: Prefabricated, mechanically fastened, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

2.3 FABRICATION

- A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.
- D. Miter corners and ends of wood handrails for returns.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of work.
- B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
 1. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
 - a. Provide anchoring devices to withstand imposed loads.
 - b. Adjust top caps as required to ensure tight seams.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 104313 - DEFIBRILLATORS AND CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. AED: Automated External Defibrillator, a portable device that checks the heart rhythm and can send an electric shock to the heart to try to restore a normal rhythm.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for AED cabinets.
 - 1. AED Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Size: 6 by 6 inches square.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For AED cabinets and AED's to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to AED cabinets including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.6 COORDINATION

- A. Coordinate size of AED cabinets to ensure fit of AED.
- B. Coordinate size of recessed and semi-recessed AED cabinets with wall depths.

1.7 WARRANTY

- A. For AED's: 8 years.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- B. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.2 AED CABINETS

- A. Cabinet Type: Suitable for AED.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. J. L. Industries, Inc., a division of Activar Construction Products Group; 1400 Lifestart Series.
 - b. Larsen's Manufacturing Company; Architectural Series (custom).
 - c. Modern Metal Products, Division of Technico Inc.; 180 Series.
 - d. Physio-Control, Inc.; AED Wall Cabinet.
 - e. Potter Roemer LLC; 7000 Series (custom).
- B. Cabinet Construction: Nonrated, Surface Mounted
- C. Cabinet Material: Steel sheet.
- D. Cabinet Trim Material: Same material and finish as door.
- E. Door Material: Steel sheet.
- F. Door Style: Fully glazed panel with frame.
- G. Door Glazing: Tempered float glass (clear).
- H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide projecting door pull and friction latch.
 - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- I. Accessories:
 - 1. Identification:
 - a. Identify AED cabinet with the label "EMERGENCY DEFIBRILLATOR" or "AED" with heart and lightning symbol as standard with manufacturer.
 - 1) Location: Applied to cabinet trim or decal on cabinet glazing.
 - 2) Lettering Color: Red.
- J. Finishes:
 - 1. Manufacturer's standard baked-enamel paint for the following:
 - a. Exterior of cabinet, door, and trim except for those surfaces indicated to receive another finish.
 - b. Interior of cabinet and door.
 - 2. Steel: Baked enamel or powder coat.

2.3 AUTOMATED EXTERNAL DEFIBRILLATORS (AED's)

- A. AED Type: FDA-cleared, semi-automatic external defibrillator designed for ease of use.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Defibtech, LLC; Lifeline AED.
 - b. Physio-Control, Inc.; LIFEPAK CR Plus.
 - c. Koninklijke Philips N.V.; HeartStart OnSite.
 - d. Zoll Medical Corporation; AED Plus.
2. Features:
 - a. Voice prompting.
 - b. Metronome/timing assistance for CPR.
 - c. Adult and child configurations.
 - d. Charging time 20 seconds or less.
 - e. Self-testing with readiness indication.
 - f. ECG data recording and storage not less than 15 minutes.
 - g. Operating temperature range 32 to 122°F.
 - h. Splash proof.
 - i. Standby life not less than 4 years.

2.4 SIGNS

- A. Wall-Mount Sign: Message: "AED" in large black letters over a red heart with lightning bolt symbol.
 1. Material: White plastic.
 2. Type: Two-sided projecting "tent" style.

2.5 FABRICATION

- A. AED Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of AED cabinets from damage by applying a strippable, temporary protective covering before shipping.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Finish AED cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" or SSPC-SP 8, "Pickling.". After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- B. Factory Prime Finish: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
- C. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed AED cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install AED cabinets in locations and at mounting heights indicated or, if not indicated, at 4'-0" above finish floor to center.
- B. AED Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Fasten mounting brackets to inside surface of AED cabinets, square and plumb.
- C. Install sign above and centered on AED cabinet at height indicated, or, if not indicated, at 6'-8" above finished floor.
- D. AED's: Place AED's in cabinets ready for use.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as AED cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust AED cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. On completion of AED cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace AED cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by AED cabinet and mounting bracket manufacturers.
- E. Replace AED cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104313

SECTION 104400 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
 - 3. Show location of knockouts for hose valves.
- B. Samples for Initial Selection: For fire-protection cabinets with factory-applied color finishes.
- C. Samples for Verification: For each type of exposed factory-applied color finish required for fire-protection cabinets, prepared on Samples of size indicated below.
 - 1. Size: 6 by 6 inches square.
- D. Sustainable Design Submittals: Refer to Division 1 Section "Sustainable Design Requirements."
- E. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- C. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.4 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.
- C. Cabinets whose doors do not remain closed due to extinguishers or other intended contents are not acceptable.

1.5 SEQUENCING

- A. Apply decals/vinyl lettering on field-painted fire-protection cabinets after painting is complete.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

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. Portable Fire Extinguishers and Fire-Protection Cabinets:
 - a. Amerex Corporation.
 - b. Ansul, Incorporated.
 - c. Babcock-Davis.
 - d. Badger Fire Protection.
 - e. Buckeye Fire Equipment Company.
 - f. Fire-End & Croker Corporation.
 - g. J.L. Industries, Inc.
 - h. Kidde; Div. of United Technologies Corp.
 - i. Modern Metal Products; Div. of Technico.
 - j. Larsen's Manufacturing Company.
 - k. MOON American.
 - l. Potter-Roemer; Div. of Smith Industries, Inc.
 - m. Strike First Corporation of America.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B.
- B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 - 1. Sheet: ASTM B 209.
 - 2. Extruded Shapes: ASTM B 221.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304.
- D. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.3 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each location indicated.
 - 1. Valves, Handles, and Levers: Manufacturer's standard.
 - 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.4 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
- B. Cabinet Construction: Nonrated.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Cabinet Material: Enameled-steel sheet.
 - 1. Shelf: Same metal and finish as cabinet.
- D. Semirecessed Cabinet: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
 - 2. Rolled-Edge Trim: 2-1/2-inch backbend depth.
- E. Cabinet Trim Material: Same material and finish as door.
- F. Door Material: Steel sheet.
- G. Door Style: Vertical duo panel with frame.
- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide projecting lever handle with cam-action latch.
 - 2. Provide manufacturer's standard hinge permitting door to open 180 degrees.
- J. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
 - 3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
 - 4. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by batteries.
- K. Finishes:
 - 1. Manufacturer's standard baked-enamel paint for the following:
 - a. Exterior of cabinet, door, and trim, except for those surfaces indicated to receive another finish.
 - b. Interior of cabinet and door.
 - 2. Steel: Baked enamel.
 - a. Color and Texture: As selected by Architect from manufacturer's full range.

2.5 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

2.6 EMERGENCY KEY ACCESS BOX

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- A. Emergency Access Box: As manufactured by The Knox Company, as required by the local Fire Marshal. Provide Knox-Vault 4400 Series, surfaced mounted, dual-lock model, nominal 7 inches by 7 inches by 4-1/2 inches deep, with mounting kit, nominal 8 inches by 8 inches by 6 inches deep. Provide with tamper switch and face flange. Provide manufacturer's polyester powdercoat finish in silver/aluminum color. No substitutions will be considered. Mount unit 6 feet above finish grade and coordinate final location with Owner and local Fire Marshal. Coordinate installation with construction and electrical connections as required for proper operation and in accordance with local Fire Marshal. Contact Knox Company: 800-552-5669.

2.7 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
 2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material.
 - a. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.8 IDENTIFICATION

- A. Identification: Provide lettering at all extinguisher locations, complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect and per below.
1. Identify fire extinguisher with the words "FIRE EXTINGUISHER."
 - a. Locations:
 - 1) At fire extinguisher cabinets, apply white lettering vertically to cabinet door.
 - 2) At mounting brackets, apply red lettering vertically or horizontally above bracket.
 - 3) At lab casework base cabinets, apply red lettering horizontally to base cabinet door.
 - b. Application Process: Decals or pressure-sensitive vinyl letters.

2.9 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 STEEL FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.
- B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for hose valves and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where fire-extinguisher cabinets will be installed.
- C. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
 - 1. Fire-Protection Cabinets: 48 inches above finished floor to top of cabinet.
 - 2. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.
- B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire-protection cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
- D. Identification: Apply at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104400

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.
- C. Window Treatment Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for each type of horizontal louver blind.
- E. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
- C. Product Standard: Provide horizontal louver blinds complying with WCSC A 100.1.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer and product name, lead-free designation, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and dirty finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 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. Horizontal Louver Blinds: Before installation begins, for each size, color, texture, pattern, and gloss indicated, full-size units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. CACO, Inc.; Summit.
 - 2. Hunter Douglas; Model CD 80.
 - 3. Levolor, a Newell Rubbermaid Company; Mark I Dustguard.
 - 4. Springs Window Fashions Division, Inc.; S3000.
- B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radiused corners.
 - 1. Width: 1 inch (25 mm).
 - a. Spacing: Either 0.77 inch (19.5 mm) or 0.79 inch (20 mm).
 - 2. Thickness: Not less than 0.008 inch (0.20 mm).
 - 3. Finish: One color.
 - a. Ionized Coating: Antistatic, dust-repellent, baked polyester finish.
- C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled; fully enclosing operating mechanisms on three sides and end plugs and the following:
 - 1. Integrated Headrail/Valance: Curved face.
 - 2. Light-blocking lower back lip.
 - 3. Tilt limiter with preselected degree settings.
- D. Bottom Rail: Formed-steel or extruded-aluminum tube, with plastic or metal capped ends top contoured to match crowned shape of slat; with enclosed ladders and tapes to prevent contact with sill.
- E. Ladders: Evenly spaced to prevent long-term slat sag.
 - 1. For Blinds with Nominal Slat Width 1 Inch (25 mm) or Less: Braided string.
- F. Lift Cords: Manufacturer's standard.
- G. Tilt Control: Enclosed worm-gear mechanism, slip clutch or detachable wand preventing overrotation, and linkage rod, and the following:
 - 1. Tilt Operation: Manual with clear plastic wand.
 - 2. Length of Tilt Control: Length required to make operation convenient from floor level.

DOBO HALL RENOVATION
PACKAGE A – RENOVATION
UNC WILMINGTON
Architect's Project No. 580999

- a. Bottom of tilt control not higher than 3'-10" above finished floor in accessible spaces.
 - 3. Tilt: Full.
 - H. Lift Operation: Manual, cord lock; locks pull cord to stop blind at any position in ascending or descending travel.
 - I. Mounting: Ceiling/top mounting, permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.
 - 1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.
 - J. Colors, Textures, Patterns, and Gloss: Hunter Douglas "Antique White" or approved equal.
- 2.2 HORIZONTAL LOUVER BLIND FABRICATION
- A. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
 - 1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
 - B. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
 - 1. Blind Units Installed between (inside) Jambs: Width equal to 1/4 inch (6 mm) per side or 1/2 inch (13 mm) total, plus or minus 1/8 inch (3.1 mm), less than jamb-to-jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm), less than head-to-sill dimension of opening in which each blind is installed.
 - 2. Blind Units Installed outside Jambs: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
 - C. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail and operating hardware, and for hardware position and blind mounting method indicated.
 - D. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
 - E. Color-Coated Finish:
 - 1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
 - F. Component Color: Provide rails, cords, ladders, and exposed-to-view metal and plastic matching or coordinating with slat color, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install horizontal louver blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior slat edges in any position are not closer than **2 inches (51 mm)** to interior face of glass. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware if any.
- B. Top Mounted: Unless indicated otherwise, install headrail to top of opening head similar to existing.

3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free of binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean horizontal louver blind surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged horizontal louver blinds that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122113

