

PROJECT MANUAL for

Town of Cary
Wake County, North Carolina
Owner Project Number: SW-3512

South Cary Water Reclamation Facility Maintenance Facility with Solar

General Construction

4900 W Lake Road
Apex, NC 27539

Bid Documents

January 13, 2025

DKA Project Number 2403

**TOWN OF CARY
WAKE COUNTY, NORTH CAROLINA**

MAYOR	HAROLD WEINBRECHT, JR.
TOWN CLERK	VIRGINIA JOHNSON
TOWN MANAGER	SEAN STEGALL
UTILITIES DIRECTOR	JAMIE REVELS



DAVIS KANE
ARCHITECTS, PA

503 OBERLIN ROAD | SUITE 300
RALEIGH, NC 27605
919.833.3737
www.daviskane.com

Town of Cary
Wake County, North Carolina
Owner Project Number
SW-3512

South Cary Water Reclamation Facility - Maintenance Facility with Solar

Bid Documents
January 13, 2025

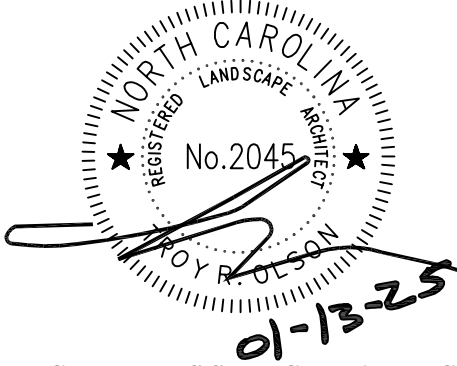
OWNER
TOWN OF CARY
Wake County, North Carolina



ARCHITECT
DAVIS KANE ARCHITECTS, PA
Raleigh, North Carolina

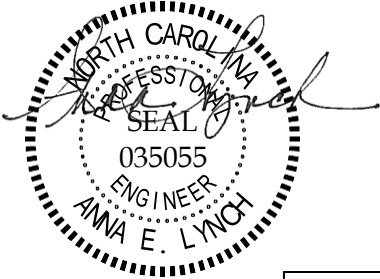


LANDSCAPE ARCHITECT/
CIVIL ENGINEER
CLH DESIGN, PA
Cary, North Carolina



Digitally signed by Steven J. Miller
Date: 2025.01.09 15:59:00-05'00'

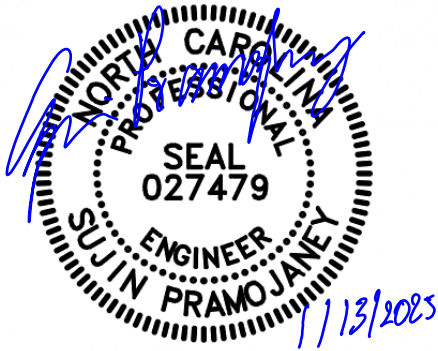
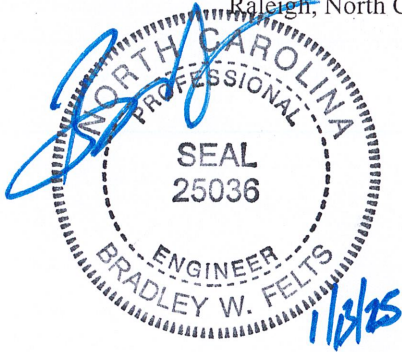
STRUCTURAL
ENGINEER
LYNCH MYKINS STRUCTURAL ENGINEERS, PC
Raleigh, North Carolina



FP/PME ENGINEER

ATLANTEC ENGINEERS, PA (NOW IMEG)

Raleigh, North Carolina



SOLAR PV CONSULTANT

PISGAH ENERGY

Asheville, North Carolina

SPECIFICATIONS

PROJECT: Town of Cary
South Cary Water Reclamation Facility with Solar
Apex, North Carolina
TOC Project No. SW-3512
DKA Project No. 2403

January 13, 2025 – Bid Documents

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PROJECT MANUAL

FOR

South Cary Water Reclamation Facility Maintenance Facility with Solar

PROJECT NO. SW-3512

January 13, 2025

TOWN OF CARY WAKE COUNTY, NORTH CAROLINA

**MAYOR:
TOWN CLERK:
TOWN MANAGER:
UTILITIES DIRECTOR**

**HAROLD WEINBRECHT, JR.
VIRGINIA H. JOHNSON
SEAN R. STEGALL
JAMIE REVELS. PE**

CERTIFICATION

I HEREBY CERTIFY THAT THE SPECIFICATIONS CONTAINED HEREIN AND THE ACCOMPANYING PLANS WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION.

SIGNED, SEALED, AND DATED THIS 13th DAY OF January, 2025



BY 

Robert Stevenson
Principal, Architect

Project Name: South Cary Water Reclamation Facility – Maintenance Facility with Solar
Project No. SW-3512

INVITATION TO BID

TOWN OF CARY
Cary, North Carolina

Sealed bids must be submitted no later than 2:00 p.m. on February 13, 2025 to the Town of Cary at the William Garmon Operations Center, Room Ops A Central Conference Room, Building A, 400 James Jackson Ave, Cary, North Carolina. Bids will be opened and read publicly for the furnishing of materials, labor, and equipment for the construction of South Cary Water Reclamation Facility Maintenance Facility with Solar, Project No. SW-3512. A brief description is as follows:

New construction of a 7,900 sq ft pre-engineered metal building system, associated footings, concrete slab on grade, exterior wall assembly, standing seam metal roof systems, doors, frames, hardware, insulated translucent fiberglass sandwich panels, overhead doors, and solar PV panels mounted to the roof. Interior spaces include seven storage bays, a welding area, an office space, and a toilet room.

The following agencies have been notified of the project: the Associated General Contractors – Raleigh office, McGraw-Hill Construction Dodge, the North Carolina Institute of Minority Economic Development – Durham office, and the CDC News – Cary office after January 13, 2025.

TOC is not responsible for bidders relying on incomplete bid documents.

Copies of Plans, Specifications and Contract documents may be obtained after January 13, 2025 online at <http://townofcary.contractorsplanroom.com>. Also, digital documents may also be obtained from the architect, Davis Kane Architects, by contacting Chad M Volk, AIA: cvolk@daviskane.com or 919.719.2811.

Contractors offering a proposal on this project must be licensed to do the specified type of contracting in the State of North Carolina. All bids must include a non-collusive affidavit. Contractors offering a proposal on this project must comply, and must ensure that their subcontractors comply, with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes, "Verification of Work Authorization," and must provide documentation or sign affidavits or any other documents requested by the Town of Cary demonstrating such compliance.

Each proposal shall be accompanied by a bid deposit in the amount of not less than five percent (5%) of the amount of the bid in the form and subject to the conditions provided in the Instruction to Bidders.

The Town of Cary reserves the right to reject any or all proposals.

Jamie Revels
Director of Utilities
Town of Cary

INSTRUCTIONS TO BIDDERS

Each proposal shall be submitted in a sealed envelope, upon blank forms provided in the Project Manual. These proposals shall be plainly marked:

“South Cary Water Reclamation Facility – Maintenance Facility with Solar, Town of Cary Project No. SW-3512“.

The envelope shall also be marked with the Bidder’s name, address, North Carolina contractor license number, and name and phone number of a contact person.

Each proposal shall be accompanied by a Bid Bond payable to the Town of Cary for an amount of not less than five percent (5%) of the total amount bid; or in lieu of the Bid Bond, the bidder may offer the bid deposit in the form of a cashier’s check, or a certified check on a bank or trust company insured by the FDIC. The bid bond must be executed by a corporate surety licensed in North Carolina. The bid deposit may be held for a period of sixty (60) days pending award of the contract. Notification of award of contract shall be evidence of intent to contract and shall extend time for holding the contractor's bid surety for a time mutually agreed between the Town of Cary and the bidder.

A pre-bid meeting, will be held with the Architect and Owner Tuesday January 28 at 11:00AM and the South Cary Water Reclamation Facility located at 4900 W Lake Road, Apex, NC 27539 (main office building) to discuss the project and answer pertinent questions. No oral interpretations will be made as to the meaning of the Contract Documents. Interpretation, if deemed necessary, will be in the form of a written Addendum.

The award of the Contract, if it is awarded, will be to the lowest responsive, responsible bidder whose qualifications indicate the award will be in the best interest of the Town of Cary (Owner). The Town of Cary reserves the right to waive technicalities and/or reject any or all proposals.

A Performance Bond and a Payment Bond, each in the amount of one hundred percent (100%) of the contract price, with a corporate surety approved by the Town of Cary, will be required for the faithful performance of the contract. Bidders shall provide certification that performance and payment bond sureties are licensed in North Carolina.

All questions about the meaning or intent of the Contract documents shall be submitted in writing to Chad M Volk, AIA, Project Manager, Davis Kane Architects, 503 Oberlin Road, Suite 300, Raleigh, NC 27605, 919.719.2811, cvolk@daviskane.com who represents the Town during the bid period. Replies will be issued by Addenda, mailed or delivered to all parties recorded by the Engineer as having received the Bidding Documents. Questions received less than five business days prior to the date for opening of Bids may not be

answered. Only questions answered by written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

Addenda, when issued, will be on file at the offices of the Owner and Engineer at least twenty-four hours before bids are opened. It shall be the Bidder's responsibility to make inquiry as to the Addenda issued. All such Addenda shall become part of the Contract Documents and all Bidders shall be bound by such Addenda, whether or not received by the Bidders.

SECTION 00300
BID PROPOSAL ("Proposal")

TO: THE TOWN OF CARY, NORTH CAROLINA ("Owner")

FROM: "BIDDER" _____

ADDRESS _____

DATE OF BID _____, 20__

The Bidder hereby signifies that it is his/her/its intention and purpose to enter into a formal Contract with the Town of Cary, North Carolina, to furnish all labor, materials, tools, equipment, apparatus, supplies, and the like required, and to do all the work necessary, for and because of the construction, erection, and/or installation of the proposed "Project":

**South Cary Water Reclamation Facility – Maintenance Facility with Solar,
TOC Project No. SW - 3512**

for the Town of Cary, North Carolina in accordance with the Contract Documents, including Addenda thereto.** There is deposited, herewith, a certified check in the amount of: _____ Dollars (\$ _____), or a Bid Bond in the amount of five percent (5%) of the total aggregate amount of the Bid, made payable to the Owner, the same to be refunded to the Bidder under the conditions of and in accordance with the terms of this Proposal, which are as follows:

THAT: The Bidder has carefully examined the Plans and Specifications and all other Contract Documents and fully understands them.

THAT: The Bidder has carefully examined the site of the Project and is familiar with the conditions under which the work, or any part thereof, is to be performed and the conditions which must be fulfilled in furnishing and/or installing, erecting or constructing any or all items of the Project.

THAT: The Bidder shall provide all necessary tools, machinery, equipment, apparatus, and all other means necessary to do all the work and shall furnish all labor, materials and all else required to complete such Contract as may be entered into, in the manner prescribed in and in accordance with the terms of the Specifications and the Contract and in accordance with the true intent and meaning thereof, and in accordance with the Plans and/or Drawings and the requirements of the Consulting Engineers under them, in a first class manner.

** Fill in appropriate Addenda number(s): _____

[Terms continued on the following page.]

THAT: The rights of the Owner and the recommendations of the Engineer shall not be questioned in the Award of the Contract.

THAT: It is the intention of the Owner to let contracts on the basis of the Bids received in accordance with G.S. 143-129 and in such manner as the Owner may deem to be for the best interests of the Owner.

THAT: The Owner reserves the right to reject any or all proposals.

THAT: The work under each Section will be awarded under one Contract and that the Owner shall have the right to include such item or items as the Owner may deem to be in the best interests of the Owner.

THAT: On being awarded the Contract, the Bidder shall execute a Performance Bond and a Payment Bond, on the forms included herein, each equal to one hundred percent (100%) of the Contract Price (Contract Sum), as security for the faithful performance of the Contract.

THAT: The Bidder shall submit, in the blank spaces provided, all data, guarantees and other information called for.

THAT: This Proposal shall be signed and submitted in the manner prescribed in the Instructions to Bidders.

THAT: Should this Proposal not be accepted by the Owner, the certified check, in the amount of:

_____ Dollars (\$ _____) or the five percent (5%) Bid Bond, as applicable, deposited herewith shall be returned to the Bidder.

THAT: Should this Proposal be accepted by the Owner and the Bidder fail or neglect to execute the Contract and furnish the required Bonds within ten (10) business days after receiving notifications of the acceptance of the Proposal and/or receipt of the formal Contract and Bond forms, the certified check, in the amount of: _____

_____ Dollars (\$ _____), or the Bid Bond, deposited herewith shall be retained by the Owner as liquidated damages, it being understood that the Owner reserves the right to extend the time allowed for executing the Contract and/or furnishing the Bond in its sole discretion.

THAT: The Bidder shall complete such Contract as may be entered into within the number of consecutive calendar days specified in the Contract from the date of the Notice to Proceed.

THAT: The Bidder proposes to enter into a Contract in accordance with this Proposal, the Plans and Specifications and the Contract Documents included herein, for the prices shown on the following pages.

THAT: The successful bidder shall be required to submit a complete detailed cost breakdown of the Lump Sum Bid Price amount (if project is a lump sum bid) for payment purposes, for approval by the Engineer, prior to the Award of the Contract.

[Terms continued on the following page.]

THAT: It is the intent of these Contract Documents to obtain a Contract based on a Lump Sum Price except where Unit Prices are specifically requested. Where a discrepancy exists between words and numbers in the Bid amount, the written words shall govern. Where a discrepancy exists between unit prices and mathematical computations in the Itemized Proposal, the unit prices and quantities in the Itemized Proposal shall govern.

THAT: The successful bidder shall have all proper Bidder licenses and other applicable licenses required under North Carolina state laws governing their respective trade(s).

THAT: The successful bidder and all subcontractors shall comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes, "Verification of Work Authorization," and shall provide documentation or sign affidavits or any other documents requested by the Town of Cary demonstrating such compliance.

THE FOLLOWING FORMS AND DOCUMENTATION SHALL BE COMPLETELY FILLED OUT AND SUBMITTED WITH THE BIDS:

1. Bid Bond (using forms provided on pages 00300-7 and 00300-9) or other allowable bid security;
2. Photocopy of Bidder's North Carolina Contractors License;
3. Enter Contractor's License Number where called for in proposal and on the outside of sealed envelope containing the proposal;
4. Statement of Compliance with requirement of the General Conditions that the Bidder will ensure that at least 20% of the Work is performed with the Bidder's employees (provide statement on bidder's letterhead);
5. Certified List of Major Subcontractors;
6. Certified List of Equipment/Material Manufacturers;
7. Bidder's Certificate as to Organization and Authority;
8. Equal Employment Opportunity Addendum;
9. Qualifications of Bidders;
10. Non-Collusive Affidavit;
11. Nondiscrimination Clause.

BID PROPOSAL
GENERAL CONSTRUCTION
FOR THE

(the "Project")

For the construction of the Project complete as indicated by the Contract Documents (in words and figures):

TOTAL LUMP SUM BID PRICE

_____ Dollars

and _____ Cents (\$ _____)

Bidder _____
(Print)

NOTE: PROPOSAL SIGNATURE REQUIRED ON PAGE 00300-12. ALL PROPOSALS MUST BE PROPERLY EXECUTED TO BE CONSIDERED A VALID BID.

CERTIFIED LIST OF MAJOR SUBCONTRACTORS

The Bidder, as part of the procedure for the submission of Bids on the Project, submits the following list of Major Subcontractors to be used in the performance of work to be done on said Project. Changes to this list after the Bid opening shall only be as approved by the Owner upon request by the Bidder or as required by the Owner based upon review of Bidder's submittals:

<u>SUBCONTRACTOR</u>	<u>SUBCONTRACTOR'S NAME AND ADDRESS</u>
<u>PLUMBING:</u>	_____
<u>HVAC:</u>	_____
<u>ELECTRICAL:</u>	_____
<u>SOLAR PANELS:</u>	_____
<u>SOLAR INVERTOR:</u>	_____

It is understood and agreed that, if awarded a Contract, the Bidder shall not make any additions, deletions or substitutions to this certified list without the consent of the Owner.

CERTIFICATION AFFIDAVIT

THE ABOVE INFORMATION IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF. I FURTHER UNDERSTAND AND AGREE THAT, IF AWARDED A CONTRACT, THIS CERTIFICATION SHALL BE ATTACHED THERETO AND BECOME A PART THEREOF.

[If Bidder is not an individual, enter entity name here]

By: _____
(Signature)

NAME OF SIGNER: _____
(Please Print or Type)

TITLE OF SIGNER: _____
(Please Print or Type)

DATE: _____

CERTIFIED LIST OF EQUIPMENT/MATERIAL MANUFACTURERS

The Bidder, as part of the procedure for the submission of Bids on the Project, submits the following list of Equipment/Materials Manufacturers to be used in the performance of work to be done on said Project. The list of Manufacturers and all equipment/materials furnished shall be based on requirements of the Contract Documents. Changes to this list after the Bid opening shall only be as approved by the Owner upon request by the Bidder or as required by the Owner based upon review of Bidder's submittals:

<u>EQUIPMENT/MATERIALS</u>	<u>MANUFACTURER</u>
Solar Invertor _____	Solar Edge _____
Solar Panels _____	Q-Cell, REC, TRINA, Mission Solar _____
_____	_____
_____	_____

It is understood and agreed that, if awarded a Contract, the Bidder shall not make any additions, deletions or substitutions to this certified list without the consent of the Owner. Failure to identify a manufacturer for any or all of the items listed shall constitute an entry of one of the manufacturers listed in its respective technical specification.

CERTIFICATION AFFIDAVIT

THE ABOVE INFORMATION IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF. I FURTHER UNDERSTAND AND AGREE THAT, IF AWARDED A CONTRACT, THIS CERTIFICATION SHALL BE ATTACHED THERETO AND BECOME A PART THEREOF.

[If Bidder is not an individual, enter entity name here]

By: _____
(Signature)

NAME OF SIGNER: _____
(Please Print or Type)

TITLE OF SIGNER: _____
(Please Print or Type)

DATE: _____

BID SECURITY:

Accompanying this Proposal is a (1) _____ in the amount of
(2) _____ Dollars
(\$ _____).

NOTE: (1) Insert the words “bank draft,” “certified check,” “bid bond”, or “cashiers check”, as the case may be.

(2) Amount must be equal to at least five percent (5%) of the total Bid.

BIDDER’S LICENSE:

The Bidder certifies that (he/she/it) is licensed as a Bidder under the specific North Carolina state law regulating his/her/its particular trade and that the number of the license under which he/she/it now operates is _____.

BIDDER’S CERTIFICATION AS TO ORGANIZATION AND AUTHORITY:

The Bidder certifies that the Affidavit of Organization and Authority, like the other documents attached hereto, form an integral part of the Proposal, and the Bidder acknowledges that the Owner will rely on the information provided therein in reviewing the Proposal and awarding a Contract.

LIQUIDATED DAMAGES:

The Bidder agrees, further, that the Owner may retain those amounts indicated in the Contract from the amount of compensation due the Bidder, under the terms of the Contract, for each and every day that the work remains incomplete and/or unsatisfactory beyond the completion date(s) specified in the Notice to Proceed. This amount is agreed upon as the proper measure of liquidated damages the Owner will sustain, per day, by the failure of the Bidder to complete the work within the stipulated time, and it is not to be construed in any sense as a penalty.

The Bidder shall not have or bring a claim against the Owner, or raise as a defense against the imposition of liquidated damages, other construction purportedly impeding Bidder’s progress or timely project completion.

(SIGNATURE PAGE)

Dated _____, 20__.

Bidder—Legal Entity (SEAL)

By: _____ (SEAL)
(SIGN HERE)

SEAL-if corporation

Printed Name

Address

() _____
Telephone No.

Subscribed and sworn to before me this ____ day of _____, 20__

Notary Public

My Commission Expires:

BID BOND

This is a Bid Bond that is subject to the provisions of Chapter 143, Article 8, Section 129(b) of the North Carolina General Statutes.

This Bid Bond is executed on _____, 20__.

The name of the PRINCIPAL is _____ (1)

_____ (2)

The name of the SURETY is _____

The TOWN OF CARY, NORTH CAROLINA is the OWNER.

The amount of the Bond is _____

_____ (Dollars) (\$_____)

KNOW BY ALL MEN BY THESE PRESENTS, the Principal and Surety above named are hereby held and firmly bound unto the above named OWNER hereinafter called the OWNER in the penal sum of the amount stated above in lawful money of the United States, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that whereas the Principal has submitted to the OWNER a certain Bid Proposal, attached hereto and hereby made a part hereof to enter into a Contract in writing, for the construction of:

NOW, THEREFORE

- (a) If said Bid Proposal shall be rejected; or in the alternate,
- (b) If said Bid Proposal shall be accepted and the Principal shall execute and deliver a Contract in the form of Contract attached hereto (properly completed in accordance with said Bid Proposal) and shall furnish a bond for his faithful performance of said Contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid Proposal, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

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

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

ATTEST:

(Principal) Secretary
(SEAL)

Principal

BY: _____ (3)

(Address)

Witness as to Principal

(Address)

ATTEST:

Surety

N. C. Resident Agent
(SEAL)

By: _____

(Name) (4)

(Address)

(Phone Number)

Witness as to Surety

(Address)

- (1) Insert the correct name of Principal.
- (2) Insert whether the Principal is a corporation, a partnership, a limited liability company or an individual.
- (3) If Principal is a partnership, all partners should execute the Bid Bond. If Bidder is a limited liability company, all managers (or all members, if the company is member-managed) should execute the Bond.
- (4) Provide contact name, address and phone number for bid bond surety.

**POWER OF ATTORNEY
(Attach)**

BIDDER'S CERTIFICATES
AFFIDAVIT OF ORGANIZATION AND AUTHORITY
SWORN STATEMENT

STATE OF _____)

COUNTY OF _____)

_____ being first duly sworn on oath deposes and says that the Bidder on the attached Bid Proposal is organized as indicated below and that all statements herein made are made on behalf of such Bidder and that this deponent is authorized to make them.

(Fill Out Applicable Paragraph)

CORPORATION:

The Bidder is a corporation organized and existing under the laws of the State of _____, it operates under the legal name of _____, and the full names of its officers are as follows:

President _____
Secretary _____
Treasurer _____

and it does _____ have a corporate seal. The _____ is/are authorized to sign construction proposals and contracts for the company by action of its Board of Directors taken _____, a certified copy of which is hereto attached. (Strike out this last phrase if not applicable.)

PARTNERSHIP:

The Bidder is a [limited/general] partnership consisting of individual/corporate partners as follows:

<u>General Partners</u>	<u>Limited Partners</u>
_____	_____
_____	_____
_____	_____

The partnership does business under the name of : _____

LIMITED LIABILITY COMPANY:

The bidder is a [member-managed/manager-managed] limited liability company consisting of the following individual/corporate members/managers:

<u>Managers</u>	<u>Members</u>
_____	_____
_____	_____
_____	_____

INDIVIDUAL:

The Bidder is an individual whose full name is:

_____ and if operating under a trade name, said trade name is as follows:

The business address of the Bidder is:

Its phone number is: _____

The contact person for this Proposal is:

Bidder

By: _____

Subscribed and sworn to before me this _____ day of _____, 20__.

Notary Public

County

My Commission Expires:

EQUAL EMPLOYMENT OPPORTUNITY ADDENDUM (“ADDENDUM”)

During the performance of the Contract the Bidder agrees as follows:

- a. The Bidder shall not discriminate against any employee or applicant because of race, color, religion, sex, or national origin. The Bidder shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to race, color, religion, sex, or national origin. Such action shall include but not be limited to the following: employment, upgrading, demotion, or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Bidder agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of the nondiscrimination clause.
- b. The Bidder shall, in all solicitations or advertisements for employees placed by or on behalf of the Bidder, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
- c. The Bidder shall send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract understanding, a notice, to be provided, advising the labor union or worker’s representative of the Bidder’s commitments under the Equal Employment Opportunity Section of the Contract, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- d. In the event of the Bidder’s noncompliance with the nondiscrimination clauses of the Contract or with any of such rules, regulations, or orders, the Contract may be canceled, terminated, or suspended in whole or in part and the Bidder may be declared ineligible for further OWNER contracts.
- e. The Bidder will include the provisions of this Addendum in every subcontract or purchase order unless exempted by rules, regulations, or orders of the OWNER so that such provisions will be binding upon each Subcontractor or vendor.

(Use the following form for execution by a CORPORATION):

ATTEST: _____
 (Assistant) Secretary

_____ Corporate Name

BY: _____
 (Vice) President

(CORPORATE SEAL)

(Use the following form for execution by a PARTNERSHIP):

_____ (SEAL)
 Partnership Name

BY: _____ (SEAL)
 General Partner

(Use the following form for execution by a LIMITED LIABILITY COMPANY):

_____ (SEAL)
 Company Name

BY: _____ (SEAL)
 Manager/Member

(Use the following form for execution by an INDIVIDUAL):

BY: _____ (SEAL)

WITNESS:

Subscribed and sworn to before me this _____ day of _____, 20__.

 Notary Public

 County

My Commission Expires:

QUALIFICATIONS OF BIDDERS

In order to assist the Owner in determining whether the Bidder is qualified to perform the Work, as set forth in the Contract Documents, the Bidder shall furnish the following information.

1. List of references who are qualified to judge as to his financial responsibility and his experience in work of similar nature to that bid upon:

2. List of previous contracting experience, including dollar values of contracts:

3. List of facilities or equipment that is available for use:

4. Name, residence, and title of the individual who will give personal attention to the work:

5. Financial Statement:

ASSETS

CURRENT ASSETS:

Cash \$ _____

Notes and Accounts Receivable _____

Inventories _____

PLANT ASSETS:

Real Estate \$ _____

Machinery _____

Good Will, Patents, etc. _____

\$ _____
Total Assets

LIABILITIES:

Notes Payable	\$ _____	
Accounts Payable	_____	
Accrued Wages	_____	
Other Liabilities	_____	\$ _____
		Total Liabilities
	EXCESS OF ASSETS OR NET WORTH	\$ _____

6. List all Claims, prior and pending, against the Bidder by the Town of Cary, including the resolution of such Claims, if any:

<u>Claim</u>	<u>Date of Claim</u>	<u>Resolution, if any</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

The existence of unresolved claims against Bidder may disqualify the Bidder from making a Bid Proposal and entering into a Contract with the Town of Cary.

Notes:

- A. The above is a suggested form for the Financial Statement, but the Bidder is not required to follow the form explicitly. The Financial Statement submitted must clearly show to the satisfaction of the Owner the Bidder's current financial condition. The Owner reserves the privilege of requiring additional information as to financial responsibility of the Bidder prior to awarding Contract.

- B. Bidder shall attach additional pages, if necessary, in order to complete the required information.

- C. The Bidder shall submit detailed information required for above Items 1 through 4 with his Bid Proposal package. The information required under Items 5 and 6 may be furnished after Bid Proposals are received if required by the Owner and Engineer to evaluate the qualifications of a prospective Bidder.

NON-COLLUSIVE AFFIDAVIT

State of _____)
) ss.
County of _____)

_____ being first duly sworn,
deposes and says that:

- (1) He/she is the _____
(Owner, Partner, Officer, Representative or Agent)
of _____, the BIDDER that has submitted the attached BID PROPOSAL;
- (2) He is fully informed respecting the preparation and contents of the attached BID PROPOSAL and of all pertinent circumstances respecting such BID PROPOSAL;
- (3) Such BID PROPOSAL is genuine and is not a collusive or sham BID PROPOSAL;
- (4) Neither the said BIDDER nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, have in any way colluded, conspired, connived or agreed, directly or indirectly, with any other BIDDER, firm, or person to submit a collusive or sham BID PROPOSAL in connection with the Contract for which the attached BID PROPOSAL has been submitted; or to refrain from bidding in connection with such Contract; or have in any manner, directly or indirectly, sought by agreement or collusion, or communication, or conference with any BIDDER, firm, or person to fix the price or prices in the attached BID PROPOSAL or of any other BIDDER, or to fix any overhead, profit, or cost elements of the BID PROPOSAL price or the BID PROPOSAL price of any other BIDDER, or to secure through any collusion, conspiracy, connivance, or unlawful agreement any advantage against The Town of Cary, or any person interested in the proposed Contract;
- (5) The price or prices quoted in the attached BID are fair and proper and are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the BIDDER or any other of its agents, representatives, owners, employees or parties in interest, including this affidavit.

BIDDER
BY _____
ITS _____
(Title)

Subscribed and sworn to before me this _____ day of _____, 20__.

Notary Public County

My commission expires _____

END OF AFFIDAVIT

NONDISCRIMINATION CLAUSE

It is specifically agreed as part of the consideration of the signing of this Bid Proposal, and the resulting execution of a Contract, that, to the extent permitted by law, the parties hereto, their agents, officials, employees, contractors, agents, successors, or permitted assigns shall not discriminate against any member of a protected class as defined by federal, state, or local law, including Wake County Code of Ordinances Section 34.01.

This provision shall be binding on the successors and assigns of the parties hereto with reference to the subject matter of the Contract.

(Use the following form for signatures by a CORPORATION):

ATTEST: _____ (Assistant) Secretary _____ (Printed Name) (Corporate Seal)	_____ Corporate Name BY: _____ (Vice) President _____ (Printed Name)
--	---

(Use the following form for signatures by a PARTNERSHIP):

_____ WITNESS _____ (Printed Name)	_____ Partnership Name (SEAL) BY: _____ (SEAL) General Partner
---	---

(Use the following form for signatures by a LIMITED LIABILITY COMPANY):

WITNESS	_____(SEAL) Company Name
_____ (Printed Name)	BY: _____(SEAL) Manager/Member

(Use the following form for signatures by an INDIVIDUAL):

	_____(SEAL)
	_____ (Printed Name)
WITNESS	
_____ (Printed Name)	

Subscribed and sworn to before me this _____ day of _____, 20__.

Notary Public	County
---------------	--------

My Commission Expires:

NOTICE OF AWARD

TO: CONTRACTOR/BIDDER: _____

ADDRESS: _____

FROM: _____

OWNER: Town of Cary
Cary, North Carolina

PROJECT: _____

You are hereby notified that the Owner has considered the Bid Proposal submitted by you for the above-described project in response to its Notice to Bidders dated _____.

It appears that it is to the best interest of said Owner to accept your Bid Proposal in the amount of: _____ Dollars (\$_____). You are therefore hereby notified that your Bid Proposal has been accepted **for South Cary Water Reclamation Facility Maintenance Facility with Solar.**

The Bidder is required by as a condition of its Award of the Contract to execute and deliver the formal Contract with the Owner and to furnish the required Bidder's Performance and Payment Bonds within ten (10) business days from the date of the delivery of this Notice to you.

If you fail to execute said Contract and to furnish said Bonds within ten (10) business days from the date of delivery of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Bid Proposal as abandoned and to award the work covered by your Bid Proposal to another bidder, or to readvertise the work or otherwise dispose thereof as the Owner may see fit.

Dated this _____ day of _____, 20_____.

Town of Cary, North Carolina

By: _____

Title: _____

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award is hereby acknowledged this _____ day of _____, 20_____.

Bidder

By: _____

Title: _____

- END OF SECTION -

**TOWN OF CARY, NORTH CAROLINA
BUSINESS INCLUSION**

SPECIAL INSTRUCTIONS TO BIDDERS REGARDING UTILIZATION OF MINORITY
BUSINESSES IN BUILDING CONSTRUCTION PROJECTS \$300,000 and Above

NCGS § 143-128.2 requires each city, county, or other local public entity to adopt a verifiable percentage goal for participation by minority businesses in the total value of work for building projects.

Goals and Good Faith Efforts

Town of Cary shall require contractors to make good faith efforts in the recruitment and selection of minority businesses for participation in building construction projects. Bidders responding to this solicitation shall make a good faith effort to achieve the following aspirational goals for minority business participation:

	Goal
Building Construction	10%

Bidders shall submit Business Inclusion information with their bids on the forms provided.

This information will be subject to verification by the Town of Cary prior to the contract award.

North Carolina law defines minority businesses, also known as Historically Underutilized Businesses (HUB), as firms that meet all of the following conditions:

(1) At least fifty-one percent (51%) of the business is owned by one or more persons who are members of at least one of the groups set forth in section (2), or in the case of a corporation, at least fifty-one percent (51%) of the stock is owned by one or more persons who are members of at least one of the groups set forth in section (2), and

(2) The management and daily business operations are controlled by one or more owners of the business who are members of at least one of the following groups:

- (1) Black. - A person having origins in any of the black racial groups of Africa.
- (2) Hispanic. - A person of Spanish or Portuguese culture having origins in Mexico, South or Central America, or the Caribbean islands, regardless of race.
- (3) Asian American. - A person having origins in any of the original peoples of the Far East, Southeast Asia, Asia, Indian continent, or Pacific islands.
- (4) American Indian. - A person having origins in any of the original Indian peoples of North America.
- (5) Female.
- (6) Disabled. - A person with a disability as defined in G.S. 168-1 or G.S. 168A-3.
- (7) Disadvantaged. - A person who is socially and economically disadvantaged 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."

Contractors, subcontractors, suppliers, service providers, or minority businesses who are members of joint ventures intended to satisfy Cary business inclusion goals shall be certified by the NC Office of Historically Underutilized Businesses only. A complete database of NC HUB certified firms may be found at <https://evp.nc.gov/vendors/vendorsearchadvanceform/?id=adea919c-1bb6-ee11-a569-001dd804ec4b>.

The Bidder shall make good faith efforts to encourage participation of HUB firms prior to submission of bids in order to be considered as a responsive bidder. Bidders are cautioned that even though their submittal indicates they will meet the Business Inclusion goal, they should document their good faith efforts and be prepared to submit this information, if requested.

The HUB firms listed by the Contractor on the **Identification of HUB Participation** form, which are determined by Cary to be certified, shall perform the work and supply the materials for which they are listed unless the Contractor receives prior authorization from Cary to perform the work with other forces or to obtain materials from other sources. If a contractor is proposing to perform all elements of the work with his own forces, he must be prepared to document evidence satisfactory to Cary of similar government contracts where he has self-performed.

The Contractor shall enter into and supply copies of fully executed subcontracts with each HUB or supply signed Letter(s) of Intent to the Project Manager after award of contract and prior to Notice to Proceed. Any amendments to subcontracts shall be submitted to the Project Manager prior to execution.

Instructions

The Bidder shall provide with the bid the following documentation:

Identification of HUB Participation
(if participation is zero, please mark zero—Blank forms will be considered nonresponsive)

Affidavit A (if subcontracting)

OR

Identification of HUB Participation
(if participation is zero, please mark zero—Blank forms will be considered nonresponsive)

Affidavit B (if self-performing; will need to provide documentation of similar projects in scope, scale and cost)

Within 72 hours or 3 business days after notification of being the apparent low bidder, a bidder who is subcontracting (and who provided Affidavit A with their bid) must provide the following information:

Affidavit C (if aspirational goals are met or are exceeded)

OR

Affidavit D (if aspirational goals are not met) + Documentation

After award of contract and prior to issuance of notice to proceed:

Letter(s) of Intent or Executed Contracts

****With each pay request and final payment, the prime contractors will submit HUB Documentation for Contract Payments, listing payments made to HUB subcontractors.**

*****If a change is needed in HUB Participation, submit a Request to Change HUB Participation Form. Good Faith Efforts to substitute with another HUB contractor must be demonstrated.**

Minimum Compliance Requirements:

All written statements, affidavits, or intentions made by the Bidder regarding HUB participation shall become a part of the contract between the Contractor and Cary. 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 Cary 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 Cary whether to terminate the contract for breach or not. In determining whether a contractor has made Good Faith Efforts, Cary will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts.

The North Carolina General Statutes require that bids be awarded to the lowest responsible, responsive bidder "without regard to race, religion, color, creed, national origin, sex, age, or handicapping condition." Also, contractors are not required to make purchases of materials or equipment or award subcontracts to minority businesses that do not submit the lowest responsible bid(s).

AFFIDAVIT A

**Town of Cary
County of Wake**

Listing of the Good Faith Effort

Affidavit of: _____
(Name of Bidder)

**I have made a good faith effort to comply under the following areas checked:
(A minimum of 50 points must be earned from the following list in order to have achieved a "good faith effort")**

- 1 - (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid or proposal date and notified them of the nature and scope of the work to be performed.
- 2 - (10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or provided these documents to them at least 10 days before the bid or proposals are due.
- 3 - (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- 4 - (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- 5 - (10 pts)** Attended pre-bid meetings scheduled by the public owner.
- 6 - (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- 7 - (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- 8 - (25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses establish credit.
- 9 - (20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- 10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS 143-128.2(d). Failure to abide by this statutory provision will constitute a breach of the contract.

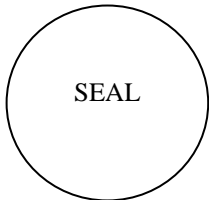
The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____

Subscribed and sworn to before me this _____ day of _____ 20____
Notary Public _____
My commission expires _____



AFFIDAVIT B

**Town of Cary
County of Wake**

Intent to Perform Contract with Own Workforce

Affidavit of: _____
(Name of Bidder)

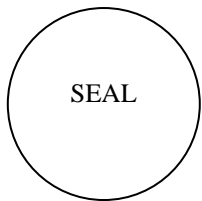
I hereby certify that it is our intent to perform 100% of the work required for the _____
_____ contract.
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: _____ Name of Authorized Officer: _____
Signature: _____
Title: _____



Subscribed and sworn to before me this _____ day of _____ 20____
Notary Public _____
My commission expires _____

AFFIDAVIT C

**Town of Cary
County of Wake**

**Portion of the Work to be
Performed by HUB Firms**

(NOTE: This form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by minority businesses as defined in GS 143-128.4(b) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit. This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours or 3 business days** after notification of being low bidder.

Affidavit of: _____ I, do hereby certify that on
(Bidder)

_____ (Project Name)

Project ID # _____ Amount of Bid \$ _____

I will expend a minimum of _____% of the total dollar amount of the contract with HUB firms. Minority Businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below.

Attach additional sheets if required.

Name and Phone Number	*HUB Category	Work Description	Dollar Value

*Minority categories: Black, African American (B), Hispanic (H), Asian American (A), American Indian (I), Female (F), Socially and Economically Disadvantaged (SE), Disabled (D)

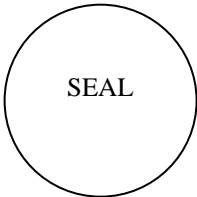
Pursuant to GS 143-128.2(d), the undersigned will enter into a formal agreement with HUB Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



Subscribed and sworn to before me this _____ day of _____ 20____
Notary Public _____
My commission expires _____

AFFIDAVIT D

**Town of Cary
County of Wake**

Good Faith Efforts

(NOTE: This form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 10% participation by HUB firms **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts. This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours or 3 business days** after notification of being low bidder.

Affidavit of: _____
(Bidder)

I will expend a minimum of _____% of the total dollar amount of the contract with HUB firms. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. (Attach additional sheets if required)

Name and Phone Number	*HUB Category	Work Description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**), American Indian (**I**), Female (**F**), Socially and Economically Disadvantaged (**SE**), Disabled (**D**)

Documentation of the Bidder's good faith efforts to meet the goals set forth in these provisions. I do certify the attached documentation as true and accurate representation of my good faith efforts. Examples of documentation shall include the following evidence:

- A. Copies of solicitation for quotes to at least three (3) minority business firms from the source list provided for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.
- B. Copies of quotes or responses received from each firm responding to the solicitation.
- C. A telephone log of follow-up calls to each firm sent a solicitation.
- D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
- E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.
- F. Copy of pre-bid roster.
- G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.
- H. Letter detailing reasons for rejection of minority business due to lack of qualification.
- I. Letter documenting proposed assistance offered to minority businesses in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with minority firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

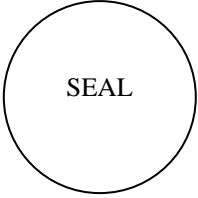
The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____

Name of Authorized Officer: _____

Signature: _____

Title: _____



Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public _____

My commission expires _____

LETTER OF INTENT HUB Subcontractor Performance

Please submit this form or executed subcontracts with HUB firms after award of contract and prior to issuance of notice to proceed.

PROJECT: _____
(Project Name)

TO: _____
(Name of Prime Bidder/Architect)

The HUB status of the undersigned is certified the NC Office of Historically Underutilized Businesses (required). ___ Yes ___ No

The undersigned is prepared to perform the following described work or provide materials or services in connection with the above project at the following dollar amount:

Work/Materials/Service Provided	Dollar Amount of Contract	Projected Start Date	Projected End Date

(Date)

(Address)

(Name & Phone No. of HUB Firm)

(Name & Title of Authorized Representative of HUB)

(Signature of Authorized Representative of HUB)

HUB DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor: _____

Address & Phone: _____

Project Name: _____

Pay Application #: _____ Period: _____

The following is a list of payments made to HUB firms on this project for the above-mentioned period.

HUB FIRM NAME	* HUB Category	AMOUNT PAID THIS MONTH	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED	AMOUNT REMAINING

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

Date: _____

Approved/Certified By: _____

Name

Title

Signature

SUBMIT WITH EACH PAY REQUEST & FINAL PAYMENT

REQUEST TO CHANGE HUB PARTICIPATION

(Submit changes only if notified as apparent lowest bidder, continuing through project completion)

Project: _____

Bidder or Prime Contractor: _____

Name & Title of Authorized Representative: _____

Address: _____ **Phone #:** _____

_____ **Email Address:** _____

Total Contract Amount (including approved change orders or amendments): \$ _____

Name of subcontractor: _____

Good or service provided: _____

Proposed Action:

Replace subcontractor

Perform work with own forces

For the above actions, you must provide one of the following reasons (Please check applicable reason):

The listed HUB, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract.

The listed HUB is bankrupt or insolvent.

The listed HUB fails or refuses to perform his/her subcontract or furnish the listed materials.

The work performed by the listed subcontractor is unsatisfactory according to industry standards and is not in accordance with the plans and specifications; or the subcontractor is substantially delaying or disrupting the progress of the work.

If replacing subcontractor:

Name of replacement subcontractor: _____

The HUB status of the contractor is certified by the NC Office of Historically Underutilized Businesses (required). Yes No

Dollar amount of original subcontract \$ _____

Dollar amount of new subcontract \$ _____

Other Proposed Action:

Increase total dollar amount of work

Add additional subcontractor

Decrease total dollar amount of work

Other

Please describe reason for requested action: _____

If adding additional subcontractor:*

The HUB status of the contractor is certified by the NC Office of Historically Underutilized Businesses (required). Yes No

**Please attach Letter of Intent or executed contract document*

Dollar amount of original subcontract \$ _____

Dollar amount of amended subcontract \$ _____

- HUB Subcontractor Payment Form

Interoffice Use Only:

Approval Y N

Date _____

Signature _____

SECTION 00500
AGREEMENT (CONTRACT)

**INSTRUCTIONS TO CONTRACTORS AND
REQUIREMENTS AS TO FORM FOR TOWN OF CARY, NC AGREEMENTS**

DO NOT REMOVE FROM AGREEMENT

Contractor has been provided two (2) duplicates of the Agreement (or shall create two copies of the electronic version if Contractor has received that from the Town). Each of the two copies shall be signed and returned to the Engineer or Architect for signature by the Owner. One counterpart will be returned to the Contractor after Owner has executed the Agreement and all initial submittals due with the Agreement have been made to Owner. The other counterpart of the Agreement will be retained for the Owner and Engineer or Architect. If the Contractor requires additional copies, he shall notify the Owner, Engineer or Architect upon his Acknowledgement of the Notice of Award.

Please observe the following in executing the attached Agreement:

1. The Owner may contract with four types of legal entities.
 - (a) If the Agreement is with an individual, that individual should sign the Agreement exactly as his/her name is set out. If the Agreement is with an individually-owned business, the Agreement should be with the individual owner, and not the named business.
 - (b) Execution on behalf of a corporation should be by the president or a vice president. An official other than president or vice president should attach documentation of his/her authority to execute and bind the corporation.
 - (c) If the Agreement is with a partnership, all general partners of the partnership should execute the Agreement unless an authorized partner is designated to execute, in which case documentation of such authorization should be attached.
 - (d) If the Agreement is with a limited liability company, all managers of the limited liability company should execute the Agreement. If the limited liability company is member-managed, all members should sign the Agreement. If only certain manager(s) or member(s) of the limited liability company are authorized to execute the Agreement, documentation of such authorization should be attached.
2. After signing the Agreement, the appropriate notary's acknowledgement, in the individual, corporate or partnership form should be completed.
3. The Agreement will already be dated as of a certain date when Contractor receives it, which date will aid the Contractor in obtaining the Performance and Payment Bonds. The date of the Bonds must not be prior to the date of the Agreement. The Performance Bond and Payment Bond shall correctly reference the Agreement, including the date assigned to it. The Bonds shall be signed by the Contractor, and its signature shall be acknowledged with the appropriate acknowledgement form. Next, the Bonds, in approved form, must be signed by the authorized agent of the Surety Company issuing the Bonds, and an executed Power of Attorney document authorizing the agent to sign must accompany the Bond Documents.

4. The Bid Form and all other documents submitted with the Bid shall be included with the Agreement. Complete the Acceptance of Notice of Award section on the last page of the Bid Proposal.
5. Page 00500-3: Fill in the Contractor name and address.
6. Pages 00500-6 through 00500-9: Choose the appropriate signature page and complete it in its entirety.
7. Pages 00500-10 through 00500-16: Complete in their entirety.
8. Page 00500-17: Attach the Certificate of Insurance. All parties required to be named as additional insured parties by the Contract Documents in connection with the attached Agreement shall be named on the Certificate of Insurance for each policy.
9. Page 00500-18: The Town shall execute the page evidencing compliance with the Fiscal Control Act prior to sending a counterpart of the Agreement to the Contractor.
10. Pages 00500-19 through 00500-21: Schedule 1 – Identification of Parties and Their Authorized Representatives. The names of all parties intended to act on behalf of the parties in the roles specified in Schedule 1 should be clearly specified in such Schedule by the Contractor and the Town.
11. Once the Town has received and approved the Agreement, the Payment and Performance Bonds and all other required documents, it will send a counterpart of the fully-executed Agreement to the Contractor. Failure to fully complete both required sets of the Agreement and timely provide all the Payment and Performance Bonds will cause delays in the approval by the Owner and therefore delay the issuance of the Notice to Proceed.

AGREEMENT

This Agreement (the "Agreement ") is made as of the ___ day of _____, in the year 20 ___, by and between the Town of Cary, North Carolina, (the "Owner") and _____ of _____, (the "Contractor").

WITNESSETH

THAT, WHEREAS, an Award of Contract (the "Award") for:

South Cary Water Reclamation Facility Maintenance Facility with Solar – Project No. SW-3512
Contract No. N/A
General Construction Single-Prime Contract

as prepared by Davis Kane Architects, PA, has recently been awarded to the Contractor by the Owner.

AND WHEREAS, the work to be performed by the Contractor or its subcontractors, and the labor, materials, equipment, apparatus, and supplies to be provided in connection therewith (collectively, the "Work") is more particularly described in the Proposal (the "Proposal") attached hereto.

AND WHEREAS, the aggregate cost of the Work (referred to as either the "Contract Price" or the "Contract Sum") and the individual prices and rates of the various components of the Work that together comprise the Contract Price, are more particularly described in the Proposal.

AND WHEREAS, it was one of the conditions of said Award that a formal contract should be executed by and between the Owner and the Contractor, evidencing the terms of said Award.

NOW THEREFORE, THIS AGREEMENT FURTHER WITNESSETH THAT the Owner and the Contractor represent, warrant, covenant and agree as follows:

It is agreed and understood that the terms and conditions of the following documentation are a part of and parcel to this Agreement to the same extent as if incorporated herein in full [check the applicable documentation]:

- _____ Standard General Conditions of the Construction Contract (EJCDC Document No. C-700, 2007 edition), as supplemented with forms for use under this Agreement by the Supplementary Conditions (as so supplemented, the "General Conditions").
- X_____ General Conditions of the Contract for Construction (AIA Document A201-2007), as supplemented with forms for use under this Agreement by the Supplementary Conditions (as so supplemented, the "General Conditions").

The Contractor hereby covenants and agrees with the Owner that it will, for a sum equal to the Contract Price, well and faithfully perform, provide and execute the Work in accordance with each and every one of the conditions, covenants, stipulations, terms and provisions contained in the Notice to Bidders/Invitation to Bid, the Instructions to Bidders, the Proposal, the Plans, the Specifications, the General Conditions and the Contract Documents (as that term is defined in the General Conditions), all of which are a part of and parcel to this Agreement to the same extent as if incorporated herein in full.

And the Owner does hereby covenant and agree with the Contractor that it will pay to the Contractor, when due and payable under the terms of the Contract Documents and the Award, the Contract Price, and that it will well and faithfully comply with and perform each and every obligation imposed upon it by said Contract Documents and the terms of said Award.

The Contractor shall commence the Work on the commencement date specified in a written order of the Owner (the "Notice to Proceed"). The Work shall be **finally and fully completed**, so that it is ready for final payment, as evidenced by the Engineer's or the Architect's written recommendation, within 305 CONSECUTIVE CALENDAR DAYS of the commencement date specified in the Notice to Proceed (such deadlines being referred to herein and in the Contract Documents as the "Contract Time" or the "Contract Times"). In the event that the Work is not completed to the standards and degrees required by the Contract Times, or either of them, liquidated damages shall be assessed against the Contractor for each day of delay as described herein below.

LIQUIDATED DAMAGES

The parties recognize and acknowledge that Owner will suffer financial losses if the Work is not completed as required within the Contract Times. They also recognize and acknowledge the delays, expense, and difficulty to both parties that would be involved in proving or contesting the amounts of those losses. Instead of requiring proof of those amounts, it is agreed that if the Contractor shall fail to complete the Work to the standard and degree required within the Contract Times, or either of them, and within any extension of time granted by the Owner in accordance with the General Conditions, then the Contractor shall pay to the Owner \$1,500/day for each calendar day after the Contract Times, or after a relevant extended time if applicable, that the Work remains incomplete to the standard or degree required by the Contract Documents.

Payment of the charges described herein shall not excuse or relieve the Contractor for any other liability under the Contract Documents for delay in the progress schedule of the Work, and all other penalties imposed on the Contractor and remedies available to the Owner under the Contract Documents shall remain in full force and effect.

IDENTIFICATION OF PARTIES AND AUTHORIZED REPRESENTATIVES

Various parties to the Contract, and parties who will be acting on another party's behalf from time to time, are identified in Schedule 1 attached hereto. Although certain parties may act on another party's behalf from time to time under the Contract Documents in certain respects (issuing directives, for instance), with respect to most documentation issued under the Contract Documents, the set of people that may bind each party is limited. The proper identification of those specific individuals (through name or title identification) that are entitled and authorized to bind the parties to the various Contract Documents that exist or may be created in connection with this Agreement is critical to the proper administration of this Agreement, and those individuals are specified in Schedule 1 attached hereto.

The parties agree that the persons (specified by names or titles/roles) of signatories to the Contract Documents that are specified on Schedule 1 attached hereto are the only appropriate parties to execute such documentation and bind the parties listed for each such Contract Document to all obligations incurred or acknowledged, and all representations and warranties made, in such documents. To that end, for example, although the Owner is the Town of Cary, as described in Schedule 1, the proper specific individuals (indicated by name or by title) to execute various documents on behalf of the Owner are specified on Schedule 1 attached hereto.

VERIFICATION OF WORK AUTHORIZATION

Contractor represents and warrants that now and continuing for the term of Agreement, Contractor, and all subcontractors, will comply with the requirements of Article 2 of Chapter 64 of the North Carolina General

Statutes, "Verification of Work Authorization," and will provide documentation or sign affidavits or any other documents requested by Town demonstrating such compliance.

NON-DISCRIMINATION POLICY

To the extent permitted by law, neither Party, their officers, employees, contractors, agents, successors, or permitted assigns, shall discriminate against any member of a protected class as defined by federal, state, or local law, including Wake County Code of Ordinances Section 34.01.

ELECTRONIC VERSION OF CONTRACT DOCUMENTS

Owner may convert a signed original of the Contract Documents to an electronic record pursuant to a North Carolina Department of Cultural Resources approved procedure and process for converting paper records to electronic records for record retention purposes. Such electronic record of the Contract shall be deemed for all purposes to be an original signed Contract.

IN WITNESS WHEREOF, said Contractor and Owner, being duly authorized, have caused these presents to be signed in their names as of the day and year first above written.

OWNER:

TOWN OF CARY,
a North Carolina municipality

By: _____
Name: Russ Overton
Title: Deputy Town Manager & CDO

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public in the County and State aforesaid, do hereby certify that _____ personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal, this the ____ day of _____, 20__.

Notary Public

[OFFICIAL SEAL]

Printed name of Notary Public

My Commission Expires: _____

[Contractor's Signature, if individual(s)]

CONTRACTOR:

_____ (SEAL)

_____ (SEAL)

_____ (SEAL)

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public of _____ County, State of _____, do hereby certify that _____ personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal, this the ____ day of _____, 20__.

Notary Public

My Commission expires: _____

[OFFICIAL SEAL]

IMPORTANT

NOTE: If Contractor is an individual, his/her signature shall be placed above. The signature of the Contractor shall also be acknowledged before a Notary Public or other person authorized by law to execute such acknowledgment.

[OR: Contractor's Signature, if a corporation]

CONTRACTOR:

a North Carolina corporation (SEAL)

Signature: _____

Printed Name: _____

Title: President/Vice President (circle one)

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public of the County and State aforesaid, do hereby certify that _____ personally appeared before me this day and acknowledged that he/she is _____ of _____, a North Carolina corporation, and that, by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by him/her as its _____.

Witness my hand and official seal, this the ____ day of _____, 20__.

[OFFICIAL SEAL]

Notary Public

Printed name of Notary Public

My Commission Expires: _____

IMPORTANT

NOTE: If the Contractor is a Corporation, the legal name of the Corporation shall be set forth above, together with the signature of the officer or officers authorized to sign Contracts on behalf of the Corporation. If the signature is by an agent other than an authorized officer of the Corporation, a Resolution must be attached hereto. The signature of the Contractor shall also be acknowledged before a Notary Public or other person authorized by law to execute such acknowledgment.

[OR: Contractor's Signature, if a partnership]

CONTRACTOR:

a [general/limited] partnership (SEAL)

By: _____(SEAL)

Name: _____

Title: General Partner

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public of _____ County, State of _____, do hereby certify that _____, General Partner of _____, a _____ [general/limited] partnership, personally appeared before me this day and acknowledged the due execution of the foregoing instrument as his/her act and deed and as the act and deed of the partnership.

Witness my hand and official seal, this the _____ day of _____, 20__.

Notary Public

My Commission Expires: _____

[OFFICIAL SEAL]

IMPORTANT

NOTE: If Contractor is a partnership, the true name of the firm shall be set forth above, together with the signatures of all the general partners (add more "by/name/title" signature lines beneath the partnership name if there is more than one general partner). If the signature is by an agent other than all general partners, a Resolution must be attached hereto. The signature of the Contractor shall also be acknowledged before a Notary Public or other person authorized by law to execute such acknowledgment.

[OR: Contractor's Signature, if a limited liability company]

CONTRACTOR:

a limited liability company (SEAL)

By: _____ (SEAL)

Name: _____

Title: Member/Manager

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public of _____ County, State of _____, do hereby certify that _____ a [Member/Manager] of _____, a _____ limited liability company, personally appeared before me this day and acknowledged the due execution of the foregoing instrument as his/her act and deed and as the act and deed of the company.

Witness my hand and official seal, this the ____ day of _____, 20__.

Notary Public

My Commission Expires: _____

[OFFICIAL SEAL]

IMPORTANT

NOTE: If Contractor is a limited liability company, the true name of the firm shall be set forth above, together with the signatures of all the managers (add more "by/name/title" signature lines beneath the company name as necessary). If the signature is by an agent other than all of the managers of the limited liability company (or all of the members, if the company is member-managed), a Resolution must be attached hereto. The signature of the Contractor shall also be acknowledged before a Notary Public or other person authorized by law to execute such acknowledgment.

PERFORMANCE BOND

This Bond is executed on _____, 20__.

The name of the PRINCIPAL is _____(1)

a _____(2)

The name of the SURETY is _____

The TOWN OF CARY, NORTH CAROLINA is the CONTRACTING BODY.

The amount of the Bond is _____
_____ Dollars (\$ _____)

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL and SURETY above named, are held and firmly bound unto the above named CONTRACTING BODY, hereinafter called the "Contracting Body", in the penal sum of the amount stated above in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas, the Principal entered into a certain Agreement with the Contracting Body, dated as of the ____day of _____, 20__ for work described by Plans and Specifications prepared by _____, herein called and referred to as the "Engineers", a copy of said Agreement is hereto attached and made a part hereof for the construction of:

-Project No. _____

NOW THEREFORE, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Agreement during the original term of said Agreement and any extensions thereof that may be granted by the Contracting Body, with or without notice to the Surety, and during the life of any guaranty required under the Agreement, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said Agreement that may hereafter be made, notice of which modifications to the SURETY being hereby waived, then, this obligation is to be void; otherwise it shall remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

ATTEST:

(Principal) Secretary
(SEAL)

Principal

By: _____(3)

(Address)

Witness as to Principal

(Address)

Surety

By: _____(4)

(Name)

ATTEST:

(Address)

By: _____
[N.C. Resident Agent]
(SEAL)

(Phone Number)

Witness as to Surety

(Address)

NOTE: Date of Bond must not be prior to date of Agreement.

- (1) Insert the correct name of Contractor.
- (2) Insert whether the Contractor is a corporation, a partnership, a limited liability company or an individual.
- (3) If Contractor is a partnership, all general partners should execute the Bond. If Contractor is a limited liability company, all managers (or all members, if the company is member-managed) should execute the Bond .
- (4) Provide contact name, address and phone number for performance bond surety.

PAYMENT BOND

This Bond is executed on _____, 20__.

The name of the PRINCIPAL is _____ (1)

a _____ (2)

The name of the SURETY is _____

The TOWN OF CARY, NORTH CAROLINA is the CONTRACTING BODY.

The amount of the Bond is _____ Dollars (\$_____)

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL and SURETY above named, are held and firmly bound unto the above named CONTRACTING BODY, hereinafter called the "Contracting Body", in the penal sum of the amount stated above in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas, the Principal entered into a certain Agreement with the Contracting Body, dated as of the ____ day of _____, 20__ for work described by Plans and Specifications prepared by _____ herein called and referred to as the "Engineers", a copy of said Agreement is hereto attached and made a part hereof for the construction of:

- Project No. _____

NOW THEREFORE, if the Principal shall promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said Agreement, and any and all duly authorized modifications of said Agreement that may hereafter be made, notice of which modifications to the SURETY being hereby waived, then this obligation is to be void; otherwise it shall remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

ATTEST:

(Principal) Secretary
(SEAL)

Principal

By: _____(3)

(Address)

Witness as to Principal

(Address)

Surety

By: _____(4)

(Name)

(Address)

(Phone Number)

ATTEST:

By: _____
[N.C. Resident Agent]
(SEAL)

Witness as to Surety

(Address)

NOTE: Date of Bond must not be prior to date of Agreement.

- (1) Insert the correct name of the Contractor.
- (2) Insert whether the Contractor is a corporation, a partnership, a limited liability company or an individual.
- (3) If Contractor is a partnership, all general partners should execute the Bond. If Contractor is a limited liability company, all managers (or all members, if the company is member-managed) should execute the Bond.
- (4) Provide contact name, address and phone number for payment bond surety.

AFFIDAVIT

(To be attached to all Agreements)

STATE OF)
) SS
COUNTY OF)

_____ being first duly sworn on oath deposes and says that
s/he is _____ (attorney-in-fact or agent) of
_____ (bonding company) surety on the attached Agreement on
_____ executed by
_____(Contractor).

Affiant further deposes and says that no officer, official or employee of the Owner has any interest directly or indirectly, or is receiving any premium, commission fee or other thing of value on account of the same or furnishing of the Bond, undertaking or Contract of Indemnity, Guaranty, Suretyship in connection with the above mentioned Agreement.

Signed _____

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

(Notary Public, _____ County, _____)

My Commission Expires _____

RESOLUTION OF CONTRACTOR'S PARTNERS, MANAGERS OR MEMBERS
(Fill in and attach if necessary)

[CORPORATION/PARTNERSHIP/LIMITED LIABILITY COMPANY NAME]

CERTIFICATE OF AUTHORITY

KNOW ALL MEN BY THESE PRESENTS:

That at a meeting of the [board of directors/partners/all members/managers] of [Contractor] a [business corporation/partnership/limited liability company] duly organized under the laws of the State of _____, held on _____, 20__ the following Resolution was adopted, which Resolution is still in effect:

RESOLVED, that [any of] the following:

[insert individual name and title]

be, and they hereby are, authorized to execute any and all documents, including contracts, on behalf of [Contractor] and further that Certificates of Authority setting out this Resolution be prepared and certified by [the Secretary of [Contractor]/all partners/all members/managers] to be used to evidence such authority.

[For a corporation, use the following certification of the Secretary:]

That I am the duly elected and qualified Secretary of [Contractor] and the keeper of records of said company; that the foregoing is a true and correct copy of a Resolution duly adopted at the meeting described above and held in accordance with its charter and bylaws, and that the same is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto affixed by name as Secretary by order of the ___ this ___ day of ___, ____.

, Secretary

STATE OF _____
COUNTY OF _____

Subscribed and sworn to before me this the _____ day of _____, 20__.

[SEAL]

Notary Public

[For partnership or limited liability company, use the following certification of all partners/members/managers, whose signatures should all appear below or otherwise attached:]

That the following consist of all [partners/members/managers] of [Contractor]; that the foregoing is a true and correct copy of a Resolution duly adopted at a meeting described above and held in accordance with its charter and bylaws, and that the same is now in full force and effect.

Partner/Member/Manager's name

Partner/Member/Manager's signature

Partner/Member/Manager's name

Partner/Member/Manager's signature

[List all partners/members/managers and include signatures for each. Use additional pages as attachments if necessary.]

STATE OF _____
COUNTY OF _____

Subscribed and sworn to before me this the _____ day of _____, 20__.

[SEAL]

Notary Public

CERTIFICATE OF INSURANCE/INSURANCE ENDORSEMENTS

(Attach)

[See the General Conditions for specific requirements.]

CERTIFICATE OF PAYMENTS

I hereby certify that I am the legal and duly appointed Financial Officer for the Owner of this project and that provision for the payment of the moneys to fall due under this Agreement has been made by appropriation duly made or by bonds or notes duly authorized, as required by the Local Government and Fiscal Control Act.

BY: _____

TITLE: _____

DATE: _____

SCHEDULE 1

IDENTIFICATION OF PARTIES AND THEIR AUTHORIZED REPRESENTATIVES

USE THIS FORM WHEN REVIEWING CONTRACT DOCUMENTATION TO ENSURE THAT PROPER AUTHORIZATION HAS BEEN GRANTED BY EACH PARTY TO SUCH DOCUMENTATION.

The “Owner” is the **Town of Cary**, a municipal corporation in North Carolina, and its successors and assigns, and is the party for whom the Work is to be performed. Except as otherwise specifically stated in the Contract Documents, neither the Architect nor the Engineer has authority to bind the Owner. Except as otherwise specified below for various contract documentation, the Owner is represented by and may be bound by the Project Manager or the Project Engineer with respect to day-to-day issues and correspondence.

The “Resident Project Representative” is: John D. Holloway.

The “Architect” is the Architect or the Architect’s authorized representative as identified in Contract Documents. The Architect is Davis Kane Architect, PA and/or any other party identified by the Owner as the Architect for the Work from time to time. In its sole discretion, the Owner may act in the stead of the Architect, exercising any of the rights or responsibilities of the Architect provided under the Contract Documents, so long as the Owner provides notice to the Contractor of its intent to do so. In its sole discretion, the Owner may delegate any of the rights or responsibilities of the Architect to a third party, who, for the purposes of the rights and responsibilities so delegated, shall be governed by the Contract Documents, so long as the Owner provides notice to the Contractor of its intent to do so.

The “Engineer” is N/A] and/or any other party identified by the Owner as the Engineer for the Work from time to time. In its sole discretion, the Owner may act in the stead of the Engineer, exercising any of the rights or responsibilities of the Engineer provided under the Contract Documents, so long as the Owner provides notice to the Contractor of its intent to do so. In its sole discretion, the Owner may delegate any of the rights or responsibilities of the Engineer to a third party, who, for the purposes of the rights and responsibilities so delegated, shall be governed by the Contract Documents, so long as the Owner provides notice to the Contractor of its intent to do so.

The Engineer’s Consultant is N/A and any other party to a subcontract with Engineer in connection with the Work.

The parties hereby agree that, notwithstanding any provision in the Contract Documents that appears to or in fact grants one party the right to act on behalf of another party, with respect to the documentation below, those individuals named below, personally or by role or title (or any person at a position “higher” than the individual or role named below) (in either event, an “Authorized Party”) shall be the only people entitled to execute the documentation for which that individual or role is named. A position is “higher” than another position in a company if the position is an office authorized by law to bind the entity or the latter position reports (directly or through other parties) to the position in question. When an Authorized Party executes a Contract Document for which it is specified as an Authorized Party, such Authorized Party shall be deemed to be acting on behalf of the party for whom it is executing such document, binding such party as to obligations acknowledged and representations and warranties made in such documentation, and no other proof of agency, authority or delegation of power is necessary to so bind such party by the execution of the document by the Authorized Party.

<u>Document</u>	<u>Party to Execute</u>	<u>Person/Role Having Capacity to Sign</u>
-----------------	-------------------------	--

Agreement	Owner	Deputy <u>Town Manager</u> , Russ Overton
	Contractor	_____ [President or Vice-President]
Application for Payment	Contractor	_____
	Resident Pjt. Representative	[John D. Holloway]
	Engineer/Architect	_____ [Davis Kane Architects]
	Owner	_____ [Jamie Revels, Utilities Director]
Field Order	Engineer/Architect	_____ [Davis Kane Architects]
	Owner	_____ [Jamie Revels, Utilities Director]
	Contractor	_____
Work Change Directive	Engineer/Architect	_____ [Davis Kane Architects]
	Owner	_____ [Jamie Revels, Utilities Director]
	Contractor	_____
<u>Document</u>	<u>Party to Execute</u>	<u>Person/Role Having Capacity to Sign</u>
Change Order (Recommendation and Contract Amendment)	Engineer/Architect (Recommend)	_____ Davis Kane Architects
	Owner	_____

(Review [not approve])

Jamie Revels, Utilities Director

Contractor
(Accept recommendation)

Contractor
(Amend Contract Sum or
Price and/or Contract Time
or Times)

Owner
(Amend Contract Sum or
Price and/or Contract Time
or Times)

*in accordance with Town of Cary
Standard Procedure #146

[Any other documentation]

Engineer/Architect

Davis Kane Architects

Owner

Jamie Revels, Utilities Director

Contractor

This Schedule 1 may be revised, amended and/or replaced by a new Schedule 1 identifying other individuals or roles entitled to execute the documentation described herein if the replacement Schedule 1 is signed by each of the parties below. The revised Schedule 1 shall be dated and attached to the Contract Documents, and a copy shall be given to all affected parties. To the extent possible, prior versions of Schedule 1 shall be removed from the Contract Documents when a replacement Schedule 1 is approved.

Town of Cary:

Contractor:

By: _____
Town Manager

By: _____
[President or Vice-President or Owner]

NOTICE TO PROCEED

TO: CONTRACTOR: _____
ADDRESS: _____

FROM: Jamie Revels, PE, Utilities Director]_
Town of Cary
400 James Jackson Ave, Cary, NC, 27512

OWNER: Town of Cary
Cary, North Carolina

PROJECT: South Cary Water Reclamation Facility, Maintenance Facility with Solar

PROJECT NO.: SW-3512 _____

CONTRACT PRICE/SUM: \$ _____

You are hereby notified to commence Work on the referenced project on _____, 20__ (the "Commencement Date"), and are to finally and fully complete the Work within _____ **CONSECUTIVE CALENDAR DAYS** of the Commencement Date. Your Contract final completion date is therefore _____, 20__.

The Agreement provides for assessment of liquidated damages for each consecutive calendar day after the above established completion date that the Work remains incomplete to the standard and degree required.

OWNER:

TOWN OF CARY, NORTH CAROLINA

By: _____

Name: _____ Jamie Revels _____

Title: _____ Utilities Director

DATE: _____



AIA[®] Document A201[®] – 2007

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

South Cary Water Reclamation Facility, Maintenance Facility with Solar
Apex, NC

THE OWNER:

(Name, legal status and address)

Town of Cary
316 N Academy Street, Cary, NC 27513

THE ARCHITECT:

(Name, legal status and address)

Davis Kane Architects, PA
503 Oberlin Road, Suite 300, Raleigh, NC 27605

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as “all” and “any” and articles such as “the” and “an,” but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect’s consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect’s or Architect’s consultants’ reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect’s consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner’s approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term “Owner” means the Owner or the Owner’s authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic’s lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner’s interest therein.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner’s obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner’s ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or

the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other

facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

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

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume

the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be

required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

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§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may

be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that

the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

- .1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- .2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
- .5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term “day” as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor’s control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor’s Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor’s right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a separate contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended

appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect

will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction

of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or

otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the

Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;

- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an

additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

Additions and Deletions Report for **AIA® Document A201® – 2007**

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 11:33:17 ET on 12/23/2024.

PAGE 1

South Cary Water Reclamation Facility, Maintenance Facility with Solar
Apex, NC

...

Town of Cary
316 N Academy Street, Cary, NC 27513

...

Davis Kane Architects, PA
503 Oberlin Road, Suite 300, Raleigh, NC 27605

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Jimmy A. Edwards, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 11:33:17 ET on 12/23/2024 under Order No. 4104245427 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ - 2007, General Conditions of the Contract for Construction, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions supplement either :

the “General Conditions of the Contract for Construction”, AIA Document A201-2007 (the “AIA”), or

the “Standard General Conditions of the Construction Contract”, EJCDC Document No. C-700, 2007 edition (the “EJCDC”),

whichever is applicable (the “General Conditions”), in connection with the Agreement between the Town of Cary as Owner and _____ as Contractor, as such General Conditions may have already been amended, revised and supplemented by other Contract Documents (as defined in the General Conditions). The attached forms supplement the General Conditions and the Contract Documents by providing forms of documentation to use in connection with the provisions in the General Conditions and Contract Documents regarding written communication among project team members and regarding memorializing Contract Document changes and changes to the Project or the Work. All capitalized terms used but not defined herein shall have the meanings ascribed to them in the General Conditions.

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APPLICATIONS FOR PROGRESS PAYMENT

Each Application for progress payment must include, as a minimum, the following information:

1. Progress payment cover letter as included on page 00800-4.
2. Town of Cary Cover Sheet as included on page 00800-5.
3. Itemized quantity sheet(s) as included on page 00800-6.
4. A Certificate of Sales Tax Paid as included on page 00800-7.
If no sales tax has been paid in the period, then a certificate should be included stating that no sales tax was paid.

ONLY THOSE PARTIES AUTHORIZED by Section 00500, Schedule 1, of the Contract Documents to execute these forms on behalf of the parties listed in each form may execute the attached forms.

***** PUT ON CONTRACTOR'S LETTERHEAD *****

DATE: _____

TO: Town of Cary

RE: _____

We hereby certify that the labor and materials listed on this request for payment have been used in the construction of this Work, or that all materials included in this request for payment and not yet incorporated into the construction are now on the site or stored at an approved location with proper insurance to protect these stored materials; and that all lawful charges for labor, materials and the like, covered by previous Certificates of Payment have been paid and that all other lawful charges on which this request for payment is based have been paid for in full or will be paid for in full from the funds received in payment of this request within ten (10) calendar days from receipt of this partial payment from the OWNER; and that all setoffs, fines owed by Contractor (to third parties or to Owner), Liquidated Damages and other reductions in the amount due to Contractor have been properly accounted for in the attached Application for Payment.

CONTRACTOR: _____

BY: _____

TITLE: _____

State of _____

County of _____

Sworn to and subscribed before me this _____ day of _____, 20____.

Notary Public (Seal)

My Commission Expires

APPLICATION FOR PAYMENT

Town of Cary, North Carolina

Project _____

Contractor _____

Project No. _____

Period _____

Payment No. _____

The undersigned Contractor certifies that to the best of its knowledge and belief, all items, units, quantities and prices of all work and material indicated on sheet(s) _____ of this periodic estimate are correct; that all Work has been performed and Materials supplied in full accordance with the terms and conditions of the construction Contract Documents between the undersigned as Contractor and the Town of Cary as Owner, dated _____, _____, and all authorized changes thereto; that the following is a true and correct statement of the Contract amount up to and including the last day of the period covered by this estimate; and that no part of the "Amount Due This Estimate" has been received.

Total Contract Amount, Including Change Orders _____

Total Amount Earned, To Date _____ % Earned

Total Setoffs, Fines, Liquidated Damages, To Date _____

Total Owed To Date Minus Setoffs, Etc. (Net Earned) _____

(Proceed if positive; else Payment Application is to account for reduction in setoffs, fines Liquidated Damages and the like: _____)

Retainage _____

Total Net Earned Less Retainage _____

Total Previously Approved _____

Amount Due This Estimate _____

(Equal to Amount Unpaid From Previous Estimate _____ minus Current Amount Due _____)

Balance to Finish, Including Retainage _____

The Contractor further certifies that all claims outstanding as of this date against the undersigned as Contractor for labor, materials, and expendable equipment employed in the performance of said Contract up to the date of this estimate have been paid in full accordance with the requirements of this Contract.

CONTRACTOR _____ BY _____ TITLE _____ DATE _____

APPROVAL FOR PAYMENT: *[Check Section 00500, Schedule 1, for parties authorized to execute below.]*

Resident Project Representative
John D Holloway

Engineer/Architect
Robert Stevenson

Town of Cary – Utilities Director
Jamie Revels

APPLICATION FOR PAYMENT

Town of Cary, North Carolina

PAYMENT NO. _____

PROJECT _____

PERIOD _____

CONTRACTOR _____

ITEM NO	DESCRIPTION OF ITEMS	UNIT	UNIT PRICE	BID QUANTITIES	CURRENT QUANTITY	QUANTITY TO DATE	CURRENT AMOUNT	CONTRACT AMOUNT	% COMP	AMOUNT EARNED TO DATE

TOTAL EARNED TO DATE _____
 Minus TOTAL PAID TO DATE _____
 Minus RETAINAGE _____
 Minus OTHER REDUCTIONS _____
 Equals AMOUNT DUE THIS ESTIMATE _____

CERTIFICATE OF SALES TAX PAID

PAYMENT NO. _____

PROJECT _____

OWNER - TOWN OF CARY, WAKE COUNTY, NORTH CAROLINA

CONTRACTOR _____

FOR PERIOD _____ TO _____

Note: Only items that become part of the building / project that the Town of Cary owns or leases are eligible to be listed. The contractor may not include in the statement items they purchased and used to fulfill the contract but did not become part of the actual constructed project. Items such as scaffolding, concrete forms, fuel for the operation of machinery and equipment, tools, equipment repair parts, equipment rentals, and blueprints are not to be included in this statement.

VENDOR	MATERIAL PURCHASED	VENDOR'S ADDRESS	INVOICE # (MUST BE ATTACHED)	DATE	INVOICE AMOUNT	TAXES PAID				COUNTY
						NC TAX _____%	COUNTY TAX _____%	TRANSIT TAX <u>0.50%</u>	TOTAL TAX BILL	

I hereby certify that the above listed vendors were paid sales tax upon purchases of **building materials** during the period covered by this construction estimate, and the property upon which such taxes were paid was or will be used in the performance of this Contract. No tax on purchases or rentals of tools and/or equipment is included in the above list. **All of the materials listed above became a part of or are annexed in the above referenced construction project.**

By _____
Signature
Title

_____, being duly sworn, certifies that the foregoing statement of sales taxes paid in connection with the referenced Contract is true to the best of his or her knowledge and belief.

Sworn to before me this _____ day of _____, 20__.

Notary Public

My commission expires _____, 20__.

Vendor is to fill out the name of the State and County/ Counties being reported. There may be instances where vendor is from another state and taking materials from inventory. ALL building materials should be reported even if it is another state/county. Currently North Carolina counties with Transit Tax – Durham, Mecklenburg, Orange and Wake.

Blanks are in place for the various rate of tax that may be paid if paying another State and County Tax Rate. North Carolina State Rate = 4.75% Counties in NC vary from 2.00% to 2.25%

Resource for Tax Rates can be found <http://www.dornc.com/downloads/gen562bycity.pdf>

Example of filled in report

VENDOR	MATERIAL PURCHASED	VENDOR'S ADDRESS	INVOICE # (MUST BE ATTACHED)	DATE	INVOICE AMOUNT	TAXES PAID				COUNTY NAME
						NC STATE TAX 4.75%	COUNTY TAX 2.00 %	TRANSIT TAX .50%	TOTAL TAX BILL	
XYZ	Lumber	100 Cary St, Cary	123	05/20/17	100.00	4.75	2.00	.50	7.25	Wake
Z2	Nails	2 nd Blvd, Durham, NC	400	03/15/17	50.00	2.38	Rate 2.25% 1.13	.25	3.76	Orange
Once Moore	Steel Beams	1 Ocean Dr, Ta	SB-100	01/01/17	1000.00	Rate 6% Fla 60.00	Rate 1% 10.00	0.00	70.00	Hillsborough

FIELD ORDER

FIELD ORDER NO.: _____

DATE: _____

PROJECT: _____

RE: _____

TO CONTRACTOR: This Field Order is issued to interpret/clarify the Contract Documents, order minor changes in the work, and/or memorialize trade-off agreements. Both parties hereby agree that the work described by this Field Order is to be accomplished without change in Contract Sum or Price, Contract Time or Times, and/or claims with other costs.

DESCRIPTION: _____

ATTACHMENTS: _____

REFERENCES: _____

RECOMMENDED:

APPROVED:

ACCEPTED:

By: _____

Engineer/Architect
(Authorized Signature*)

By: _____

Owner
(Authorized Signature*)

By: _____

Contractor
(Authorized Signature*)

Date: _____

Date: _____

Date: _____

[Authorized Signature*: Check Section 00500, Schedule 1, for parties authorized to execute above.]

Distribution:

WORK CHANGE DIRECTIVE

WORK CHANGE DIRECTIVE NO.: _____ DATE: _____

Project: _____

Contractor _____

Engineer/Architect _____

You are directed to proceed promptly with the following change(s):
Description: _____

Purpose of Work Change Directive: _____

Attachments (List documents supporting change): _____

If a claim is made that the above change(s) have affected the Contract Sum or Price or the Contract Time or Times, any claim for a Change Order based thereon will involve one or more of the following methods of determining the effect of the change(s).

Method of determining change in Contract Sum or Price:

- Unit Prices ()
- Lump Sum
- Other _____

Method of determining change in Contract Time or Times:

- Contractor's records
- Engineer's records
- Other _____

Estimated (increase/decrease) in Contract Price:

\$ _____

Estimated (increase/decrease) in Contract Times:

Substantial Completion: _____ days;
Ready for final payment: _____ days;

If the change involves an increase, the estimated price and times are not to be exceeded without further authorization.

RECOMMENDED:

APPROVED:

ACCEPTED:

By: _____
Engineer/Architect
(Authorized Signature*)

By: _____
Owner
(Authorized Signature*)

By: _____
Contractor
(Authorized Signature*)

Date: _____

Date: _____

Date: _____

[Authorized Signature*: Check Section 00500, Schedule 1, for parties authorized to execute above.]

WORK CHANGE DIRECTIVE INSTRUCTIONS

A. GENERAL INFORMATION

This document was developed for use in situations involving changes in the Work which, if not processed expeditiously, might delay the Project. These changes are often initiated in the field and may affect the Contract Sum or Price or the Contract Time or Times. This is not a Change Order, but only a directive to proceed with Work that may be included in a subsequent Change Order.

For supplemental instructions and minor changes not involving a possible change in the Contract Sum or Price or the Contract Time or Times a Field Order may be used.

B. COMPLETING THE WORK CHANGE DIRECTIVE FORM

Engineer or Architect initiates the form, including a description of the items involved and attachments.

Based on conversations between Engineer or Architect and Contractor, Engineer or Architect completes the following:

METHOD OF DETERMINING CHANGE, IF ANY, IN CONTRACT SUM OR PRICE: Mark the method to be used in determining the final cost of Work involved and the estimated net effect on the Contract Sum or Price. If the change involves an increase in the Contract Sum or Price and the estimated amount is approached before the additional or changed Work is completed, another Work Change Directive must be issued to change the estimated price or Contractor may stop the changed Work when the estimated price is reached. If the Work Change Directive is not likely to change the Contract Sum or Price, the space for estimated increase (decrease) should be marked "Not Applicable."

METHOD OF DETERMINING CHANGE, IF ANY, IN CONTRACT TIME OR TIMES: Mark the method to be used in determining the change in Contract Time or Times and the estimated increase or decrease in Contract Time or Times. If the changes involves an increase in the Contract Time or Times and the estimated times are approached before the additional or changed Work is completed, another Work Change Directive must be issued to change the times or Contractor may stop the changed Work when the estimated times are reached. If the Work Change Directive is not likely to change the Contract Time or Times, the space for estimated increase (decrease) should be marked "Not Applicable."

Once Engineer or Architect has completed and signed the form, all copies should be sent to Owner for authorization because neither Engineer nor Architect alone has the authority to authorize changes in the Contract Sum or Price or the Contract Time or Times. Once authorized by Owner, a copy should be sent by Engineer or Architect to Contractor. The Contract Sum or Price and the Contract Time or Times may only be changed by Change Order signed by Owner and Contractor with Engineer's or Architects' recommendations. *Furthermore, only those parties specified by Section 00500, Schedule 1, of the Contract Documents as being authorized to sign the Work Change Directive Form on behalf of each party may execute a valid Work Change Directive Form.*

Once the Work covered by this directive is completed or final cost and times are determined, Contractor should submit documentation for inclusion in a Change Order.

THIS IS A DIRECTIVE TO PROCEED WITH A CHANGE THAT MAY AFFECT THE CONTRACT SUM OR PRICE OR THE CONTRACT TIME OR TIMES. A CHANGE ORDER, IF ANY, SHOULD BE CONSIDERED PROMPTLY.

CHANGE ORDER

CHANGE ORDER NO.: _____ DATE: _____

Project: _____

Contractor: _____

Engineer/Architect: _____

CONTRACTOR is directed to make the following changes in the Contract Documents.

Description: _____

Attachments: _____

CHANGE IN CONTRACT SUM OR PRICE:	CHANGE IN CONTRACT TIME OR TIMES:
Original Contract Price \$ _____	Original Contract Times Final Completion: _____ days or dates
Net change from previous Change Orders No. ____ to No. ____: \$ _____	Net change from previous Change Orders No. ____ to No. ____: _____ days
Contract Sum or Price prior to this Change Order \$ _____	Contract Times prior to this Change Order Final Completion: _____ days or dates
Net Increase (decrease) of this Change Order \$ _____	Net Increase (decrease) of this Change Order _____ days
Contract Sum or Price with all approved Change Orders \$ _____	Contract Times with all approved Change Orders Final Completion: _____ days or dates

RECOMMENDED:

REVIEWED:

ACCEPTED:

By: _____
Engineer/Architect
(Authorized Signature*)

By: _____
Town of Cary
Utilities Director
(Authorized Signature*)

By: _____
Contractor
(Authorized Signature*)

Date: _____

Date: _____

Date: _____

[Authorized Signature*: Check Section 00500, Schedule 1, for parties authorized to execute above.]

CHANGE ORDER NO.: _____

Page ____ of ____

ELECTRONIC SIGNATURES. CONTRACTOR acknowledges and agrees that the electronic signature application DocuSign may be used, at the sole election of the Town, to execute this Change Order and any associated documents. By selecting "I Agree," "I Accept," or other similar item, button, or icon via use of a keypad, mouse, or other device, as part of the DocuSign application, CONTRACTOR consents to be legally bound by the terms and conditions of this Change Order and that such act constitutes CONTRACTOR's signature as if actually signed by CONTRACTOR in writing. CONTRACTOR also agrees that no certification authority or other third-party verification is necessary to validate its electronic signature and that the lack of such certification or third-party verification will not in any way affect the enforceability of its electronic signature. CONTRACTOR acknowledges and agrees that delivery of a copy of this Change Order or any other document contemplated hereby, through the DocuSign application, will have the same effect as physical delivery of the paper document bearing an original written signature.

The adjustment in Contract Sum or Price and/or Contract Time or Times stated in this Change Order shall comprise the total price and/or time adjustment due or owed the CONTRACTOR for the work or changes defined in this Change Order. By executing the Change Order, the CONTRACTOR acknowledges and agrees that the stipulated price and/or time adjustments include the costs and delays for all work contained in the Change Order, including costs and delays associated with the interruption of schedules, extended overheads, delay, and cumulative impacts or ripple effect on all other non-affected work under this Contract. Signing of the Change Order constitutes full and mutual accord and satisfaction for the adjustment in Contract Sum or Price or Contract Time or Times as a result of increases or decreases in costs and time of performance caused directly and indirectly from the change, subject to the current scope of the entire work as set forth in the Contract Documents. Acceptance of the waiver constitutes an agreement between OWNER and CONTRACTOR that the Change Order represents an equitable adjustment to the Contract, and that CONTRACTOR waives all rights to file a claim on this Change Order after it is properly executed.

IN WITNESS WHEREOF, the undersigned have caused the execution hereof:

CONTRACTOR (shall be authorized to execute contract in accordance with Section 00500, Schedule 1):

OWNER:
TOWN OF CARY

By: _____
Name: _____
Title: _____
Date: _____

By: _____
Name: Jamie Revels, PE
Title: Utilities Director
Date: _____

This instrument has been preaudited in the manner required by Local Government Budget and Fiscal Control Act.

Deputy Finance Officer

Date

CHANGE ORDER INSTRUCTIONS

A. GENERAL INFORMATION

This document was developed to provide a uniform format for handling Contract changes that affect the Contract Sum or Price or the Contract Time or Times. Changes that have been initiated by a Work Change Directive must be incorporated into a subsequent Change Order if they affect the Contract Sum or Price or the Contract Time or Times.

Changes that affect the Contract Sum or Price or the Contract Time or Times should be promptly covered by a Change Order. The practice of a cumulating change order items to reduce the administrative burden may lead to unnecessary disputes.

If milestones have been listed, any effect of a Change Order thereon should be addressed.

For supplemental instructions and minor changes not involving a change in the Contract Sum or Price or the Contract Time or Times, a Field Order may be used.

B. COMPLETING THE CHANGE ORDER FORM

Engineer or Architect initiates the form, including a description of the changes involved and attachments based upon documents and proposals submitted by Contractor, or requests from Owner, or both.

Once Engineer or Architect has completed and signed the form, all copies should be sent to Contractor for approval. If the Contractor is a Corporation, an officer (President or Vice-President) of the corporation must sign the change order. If an agent other than an authorized officer of the Corporation signs, a Resolution giving authorization from the Board of Directors must be attached. *In any event, only those parties specified by the 00500 Agreement, Schedule 1, as being authorized to sign the Change Order Form on behalf of each party may execute a valid Change Order Form.* After approval by Contractor, all copies should be sent to Owner for approval. Engineer or Architect should distribute executed copies after approval by Owner.

If a change only applies to the Contract Sum or Price or to the Contract Time or Times, cross out the part of the tabulation that does not apply.

CONTRACTOR'S RELEASE OF OWNER PRIOR TO FINAL PAYMENT

The Contractor, known as _____,
for the construction of Project: _____,
hereby and forever releases the Town of Cary (Owner), its officers, agents, and [Engineers/Architects]:
_____, from all past, present, and future claims and liability
to the Contractor for anything done or furnished for, relating to, or for any act of neglect of the Owner, its
engineers, or any persons relating to or affecting the work.

Contractor's Certification:

Contractor: _____

Authorized Representative: _____

Date: _____

CONSENT OF SURETY COMPANY TO FINAL PAYMENT

PROJECT: _____

OWNER: _____

CONTRACTOR: _____

CONTRACT DATE: _____

TO: _____

In accordance with the provisions of the Contract between the Town of Cary (Owner), and the Contractor, known as _____, the Surety Company, known as _____, on bond of Contractor, hereby approves of the final payment to Contractor, and agrees that final payment to Contractor shall not relieve the Surety Company of any of its obligations to the Owner as set forth in said Surety Company's bond.

In witness whereof, the Surety Company has hereunto set its hand this ____ day of _____ in the year _____.

Surety Company

Signature of Authorized Representative

[Seal]

Typed Name and Title of Authorized Representative

FINAL RECEIPT

Contract: _____

Received this _____ day of _____, 20__ as full and final payment of the cost of all improvements provided for in the foregoing Contract the sum of _____ Dollars and _____ Cents, (\$ _____), in cash (directly or as setoff against fines, Liquidated Damages, or other amounts owed to the Owner), being the full amount accruing to the undersigned by virtue of said Contract, said cash covering and including full payment for all extra work and material furnished by the undersigned in the construction of said improvements, and all incidentals thereto, and the undersigned hereby releases the said _____ from all claims whatsoever growing out of the said Contract.

These presents are to certify that all persons doing work upon or furnishing materials or supplies for said improvements under the foregoing Contract have been paid in full.

The undersigned further certifies that all taxes imposed by Chapter 212, North Carolina Statues (Sales and Use Tax Act), as amended, have been paid and discharged.

CONTRACTOR

By: _____ (Seal)

(Typewritten Name)

STATE OF _____
COUNTY OF _____

Subscribed and sworn to before me this the _____ day of _____, 20__.

[SEAL]

Notary Public

SECTION 00810 – ADDITIONAL SUPPLEMENTAL GENERAL CONDITIONS

The following supplements modify the General Conditions of the Contract for Construction. Where a portion of the General Conditions is modified or any paragraph, subparagraph or clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of the General Conditions shall remain in effect.

Article 1: General Provisions

Add subparagraph (1.1.5.5) to paragraph 1.1.5 as follows:

1.1.5.5 The drawings contained within the set are as follows:

Sheet	Title	Drawing Date	Signature Date
G001	TITLE SHEET	1/13/25	1/13/25
G002	APPENDIX B	1/13/25	1/13/25
G003	APPENDIX B	1/13/25	1/13/25
G004	LIFE SAFETY	1/13/25	1/13/25
C000	COVER	1/13/25	1/13/25
C001	STAKING & LANDSCAPE PLAN	1/13/25	1/13/25
C101	EXISTING CONDITIONS & DEMOLITION PLAN	1/13/25	1/13/25
C201	STAKING AND LANDSCAPE PLAN	1/13/25	1/13/25
C301	EROSION CONTROL & GRADING PLAN	1/13/25	1/13/25
C401	UTILITY PLAN	1/13/25	1/13/25
C701	DETAILS	1/13/25	1/13/25
C702	DETAILS	1/13/25	1/13/25
C703	DETAILS	1/13/25	1/13/25
A001	GENERAL NOTES AND LEGENDS	1/13/25	1/13/25
A100	FLOOR PLANS	1/13/25	1/13/25
A110	REFLECTED CEILING PLANS	1/13/25	1/13/25
A120	ROOF PLANS	1/13/25	1/13/25
A201	ELEVATIONS AND BUILDING SECTIONS	1/13/25	1/13/25
A300	WALL SECTIONS	1/13/25	1/13/25
A310	DETAILS	1/13/25	1/13/25
A311	DETAILS	1/13/25	1/13/25
A700	STOREFRONT AND DOOR SCHEDULE	1/13/25	1/13/25
I100	FINISH SCHEDULES AND PLANS	1/13/25	1/13/25
S001	GENERAL NOTES	1/13/25	1/13/25
S002	GENERAL NOTES	1/13/25	1/13/25
S101	FOUNDATION PLAN	1/13/25	1/13/25
S102	SLAB PLAN	1/13/25	1/13/25
S111	MECHANICAL PLATFORM FRAMING PLAN	1/13/25	1/13/25
S112	MECHANICAL PLATFORM SLAB PLAN	1/13/25	1/13/25
S301	SECTIONS	1/13/25	1/13/25
S302	SECTIONS	1/13/25	1/13/25
S501	TYPICAL DETAILS	1/13/25	1/13/25
S502	TYPICAL DETAILS	1/13/25	1/13/25
S503	TYPICAL DETAILS	1/13/25	1/13/25
P000	PLUMBING NOTES, LEGEN, DETAILS, AND SCHEDULES	1/13/25	1/13/25
P100	PLUMBING PLAN	1/13/25	1/13/25
P200	PLUMBING DETAILS AND WASTE RISER	1/13/25	1/13/25
M000	MECHANICAL NOTES, LEGEND, AND SCHEDULES	1/13/25	1/13/25
M100	MECHANICAL PLAN	1/13/25	1/13/25
M200	MECHANICAL DETAILS	1/13/25	1/13/25

E000	ELECTRICAL LEGEND, NOTES, FIXTURE SCHEDULE	1/13/25	1/13/25
E100	LIGHTING PLAN, POWER PLAN	1/13/25	1/13/25
E101	ELECTRICAL ROOF PLAN SITE PLAN	1/13/25	1/13/25
E200	POWER RISER, PANEL SCHEDULE	1/13/25	1/13/25
E201	PV SYSTEM DETAILS AND DIAGRAM	1/13/25	1/13/25

Article 4: Architect

Add subparagraph (4.1.4) to paragraph 4.1 as follows:

- 4.1.4 Principal consultants for the project are as follows:
- a. The Architect is: **Davis Kane Architects, PA**
503 Oberlin Road, Ste 300
Raleigh, North Carolina 27605
P: (919) 833-3737

 - b. The Architect's Consulting Engineers:
Landscape/Civil: **CLH Design, PA**
400 Regency Forest Drive, Ste 120
Cary, North Carolina 27518
P: (919) 319-6716

 - c. Structural Engineer: **Lynch Mykins Structural Engineers, PC**
301 N West St, Ste 105
Raleigh, North Carolina 27603
P: (919) 782-1833

 - d. FP/MEP Engineers: **Atlantec Engineers, Inc. (now IMEG)**
3221 Blue Ridge Road, Ste 113
Raleigh, North Carolina 27612
P: (919) 571-1111

 - e. Solar PV Consultant: **Pisgah Energy**
53 Ashland Avenue, Suite 103
Asheville, NC 28801
P: (828): 206-4780

Article 8: Time

Add subparagraph (8.2.1.1) to paragraph 8.2.1 as follows:

- 8.2.1.1 Contract Time shall be no more than 365 calendar days commencing at the Date of Notice to Proceed until the Date of Substantial Completion.

Add subparagraph (8.4.1.1) to paragraph 8.4.1 as follows:

- 8.4.1.1 Liquidated Damages shall be \$1,500 per calendar day.

Add subparagraph (8.4.1.2) to paragraph 8.4.1 as follows:

- 8.4.1.2 Interim Liquidated Damages shall be \$5,000 per calendar day.

Article 3: Contractor

Paragraph 3.4.3, revise first sentence of paragraph as follows:

CERTIFICATE OF SALES TAX PAID

PAYMENT NO. _____

PROJECT _____

OWNER - TOWN OF CARY, WAKE COUNTY, NORTH CAROLINA

CONTRACTOR _____

FOR PERIOD _____

TO _____

Note: Only items that become part of the building/project that the Town of Cary owns or leases are eligible to be listed. The contractor may not include in the statement items they purchased and used to fulfill the contract but did not become part of the actual constructed project. Items such as scaffolding, concrete forms, fuel for the operation of machinery and equipment, tools, equipment repair parts, equipment rentals and blueprints are not to be included in this statement.

As of January 1, 2017, Repair, Maintenance and Installation (RMI) projects are subject to tax for labor and materials.

VENDOR	MATERIAL PURCHASED	VENDOR'S ADDRESS	INVOICE # (MUST BE ATTACHED)	DATE	INVOICE AMOUNT (Pre-tax)	TAXES PAID					TOTAL TAX BILL	COUNTY NAME
						NC STATE TAX (4.75 %)	Other State Tax Paid	County Tax (2.00%)	County Tax (2.25%)	TRANSIT TAX (0.50%)		
											-	
											-	
											-	
											-	
											-	
											-	
											-	
											-	
											-	
											-	
TOTAL TAX						-	-	-	-	-	-	

I hereby certify that the above listed vendors were paid sales tax upon purchases of **building materials** during the period covered by this construction estimate and the property upon which such taxes were paid was or will be used in the performance of this contract. **No tax on purchases as listed above in yellow highlighted area is included in this certificate. All of the materials listed above became a part of or are annexed in the above referenced construction project.**

By _____
Signature

Title

_____, being duly sworn, certifies that the foregoing statement of sales taxes paid in connection with the referenced Contract is true to the best of his or her knowledge and belief.

to before me this _____ day of _____, 20 ____

Notary Public

Commission expires _____, 20 ____

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Project information.
- 2. Work covered by Contract Documents.
- 3. Work performed by Owner.
- 4. Work under Owner's separate contracts.
- 5. Contractor's use of site and premises.
- 6. Coordination with occupants.
- 7. Work restrictions.
- 8. Specification and Drawing conventions.

B. Related Requirements:

- 1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
- 2. Division 01 Section "Execution" for coordination of Owner-installed products.

1.3 PROJECT INFORMATION

A. Project Identification: South Cary Water Reclamation Facility - Maintenance Facility with Solar

- 1. Project Location: 4900 W Lake Road, Apex, North Carolina 27539.

B. Owner: Town of Cary
Transportation & Facilities Department
316 N. Academy Street
Cary, North Carolina 27513
Owner's Representative: John Holloway
Phone: (919) 462-3875
Email: john.holloway@townofcary.org

C. Architect: Davis Kane Architects, PA
503 Oberlin Road, Suite 300
Raleigh, North Carolina 27605
Contact: Robert Stevenson & Chad Volk
Phone: (919) 833-3737
Email: rstevenson@daviskane.com; cvolk@daviskane.com

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

1. Civil Engineer & Landscape Architect:
CLH Design, PA
400 Regency Forest Drive, Suite 120
Cary, North Carolina 27518
Contact: Keith Downing, PLA, ASLA
Phone: (919) 319-6716
Email: kdowning@clhdesignpa.com
2. Structural Engineer:
Lynch Mykins Structural Engineers, PC
301 N. West Street, Suite 105
Raleigh, NC 27603
Contact: Bowen Shen, PE
Phone: (984) 222-1539
Email: bshen@lynchmykins.com
3. FP/MEP Engineer:
Atlantec Engineers, PA
3221 Blue Ridge Road, Suite 113
Raleigh, NC 27612
Contact: Brad Felts, PE
Phone: (919) 571-1111
Email: brad@atlantecengineers.com
4. Solar PV Consultant:
Pisgah Energy
53 Ashland Avenue, Suite 103
Asheville, NC 28801
Contact: Evan Becka
Phone: (828) 206-4780

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. Related requirements and conditions that are indicated on the Contract Documents include, but are not limited to, the following:
 1. Existing Conditions.
 2. Other Work (furnishings and equipment) to be performed by Owner.
- B. Summary by References:
 1. The work can be summarized by reference to the Contract, General Conditions, Supplementary General Conditions, Specification Sections as included in the "Table of Contents" bound herein, Drawings as listed in the "Index of Drawings" bound herein, Addenda, and Modifications to the Contract Documents as issued after the initial printing of this Project Manual, and including but not necessarily limited to printed matter referenced by any of these. It is recognized that work of Contract may also be unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions, and other forces outside the Contract Documents.
- C. Abbreviated Written Summary:
 1. Briefly, and without force and effect upon Contract Documents, work of Contract can be summarized as follows:
 - a. General:

- 1) New construction includes a pre-engineered metal building system, associated footings, concrete slab on grade, alternate steel structural system for a mezzanine, exterior wall assembly, standing seam metal roof systems, doors, frames, hardware, insulated translucent fiberglass sandwich panels, overhead doors, and solar PV panels mounted to the roof. The work also includes metal storage shelving and wire storage lockers.
- b. Plumbing, Mechanical, Electrical:
 - 1) The work includes plumbing fixtures, HVAC unit, electric heaters, and electrical power and light fixtures
- c. Site/Civil:
 - 1) The work includes removal of site amenities, site clearing, earth moving, new paving, and water, sanitary and storm utilities.
- d. Solar:
 - 1) Panels: Qty 215, 490 watts each
 - 2) DC system size is 105.35 kilowatts
 - 3) Inverter (AC) size is 80 kilowatts
 - 4) Estimated annual (first year) production is 145,649.2 kilowatt hours
 - 5) Commensurate annual CO2 reduction as calculated by the EPA greenhouse gas equivalency calculator is 112 tons

D. Type of Contract:

- 1. Project will be constructed under a single prime contract.

1.5 WORK PERFORMED BY OWNER

- A. Cooperate fully with Owner, so work may be carried out smoothly, without interfering with or delaying Work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
- B. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory Work under this Contract.

1.6 WORK UNDER OWNER'S SEPARATE CONTRACTS

- A. Work with Separate Contractors: Cooperate fully with Owner's separate contractors, so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under Owner's separate contracts.

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways: Keep parking and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.8 VEHICULAR ACCESS

- A. Emergency Vehicle Access:
 1. Provide unimpeded access for emergency vehicles to service the operational areas. Maintain 20-foot-wide driveways with turning space between and around combustible materials.
 2. Provide and maintain access to fire hydrants free of obstructions.
- B. Construction Vehicle Access and Parking:
 1. Provide means of removing mud from vehicle wheels before entering streets.
 2. Use existing on-site roads for construction traffic, unless otherwise indicated on Drawings. Document pre-existing conditions surrounding the construction activities and where construction traffic will occur on the Owner's Property. Existing roadways, sidewalks, curb and gutter, utilities and other site elements to remain shall be protected, and if damaged by construction activities, shall be repaired to its pre-existing condition.
 3. Avoid traffic loading beyond paving design capacity.
 4. Arrange for temporary parking areas as necessary to accommodate construction personnel. Obtain approval from Owner prior to use.

1.9 COORDINATION WITH OCCUPANTS

- A. Owner Occupancy: Owner will occupy and operate existing buildings and yard areas that are adjacent to the work area. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
 1. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.10 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
 2. Refer to phasing requirements in the Drawings for limits assigned to stipulated Construction Phases.
- B. On-Site Work Hours: Limit work to between 7am to 7pm, Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.

1. Weekend Hours: not permitted unless approved by Owner.
 2. Early Morning Hours: Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
- C. On-Site Work Day Restrictions: Do not perform work resulting in utility shutdowns on-site during work black-out days indicated below:
1. Coordinate with owner’s schedule of events. Allow 15 black-out days throughout the duration of construction.
- D. 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 for temporary utility services according to requirements indicated:
1. Notify Owner not less than seven days in advance of proposed utility interruptions.
 2. Obtain Owner's written permission before proceeding with utility interruptions.
 3. The transformer outage shall be limited to 48 hours in coordination with the owner’s event schedule and Duke Energy. The Interim Liquidated Damages will apply for any period beyond 48 hours.
- E. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
1. Notify Owner not less than two days in advance of proposed disruptive operations.
 2. Obtain Owner's written permission before proceeding with disruptive operations.
- F. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site is not permitted.
- G. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
1. Identification tag to list contractor name and name of company.
 2. Delivery personnel not required to be badged.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

1.12 INDEX OF DRAWINGS

- A. See “Additional Supplemental General Conditions” for Index of Drawings.

PART 2 - PRODUCTS NOT APPLICABLE

PART 3 - EXECUTION NOT APPLICABLE

END OF SECTION 011000

SECTION 012100 - ALLOWANCES

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 governing allowances.
 - 1. Certain items of Work are to be provided and installed to the extents indicated in the Schedule of Allowances. These allowances include installation, taxes, delivery, overhead and profit, fees, etc.
 - 2. Lump-sum and Quantity allowances are for use solely at the Owner's discretion.
 - 3. Lump-sum and Quantity allowances are for Work above and beyond that which is shown, delineated and/or quantified elsewhere in the Contract Documents.
 - 4. The Work described in the Schedule of Allowances is identical to Work described elsewhere in the Contract Documents and the full requirements of the Contract Documents apply to the applicable Work described in the Schedule of Allowances.
 - 5. The cost for all Allowances shall be included in the Base Bid price. The cost for unused Allowances shall be credited back to the Owner.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Unit-cost allowances.
 - 3. Quantity allowances.
- C. Related Requirements:
 - 1. Division 01 Section "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.

1.3 SUBMITTALS

- A. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.4 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.
- B. Prepare Construction Schedule to include all Allowances as though they will be incorporated in the full quantities indicated in the Schedule of Allowances.

1.5 ALLOWANCES ADMINISTRATIVE REQUIREMENTS

- A. Allowances Log: Prepare, maintain, and distribute a tabular log of allowances usage organized by the allowance number. Distribute current log at each Progress Meeting but no greater than on a monthly interval. Provide log with not less than the following information:
 - 1. Project name and Owner ID No.
 - 2. Name and address of Architect and General Contractor.
 - 3. Summary page with each allowance number, description, unit quantity, unit price, and units used to date, allocated by Bid Package. Sum total dollar quantity used-to-date and sum remaining for each allowance.
 - 4. Within the Allowances Log, to support the Summary Page, track the date, description of use, and units used for each allowance or portion thereof utilized.
- B. Unit-Cost Allowance Reconciliation: Contractor shall provide documentation to Architect verifying actual cost of materials purchased for use in the Work. If the actual purchase cost is lower than the specified Unit-Cost the balance shall be credited back to the Owner. If the actual cost of the materials are higher than the specified Unit-Cost the Contractor shall submit a change proposal for the cost difference.

1.6 LUMP-SUM ALLOWANCES

- A. Lump Sum Allowances will be utilized solely at the Owner's discretion. The designated allowances include work identical to Work in the base scope. If the Owner intends to utilize a Lump Sum Allowance, the Architect will send written directive or a Field Order to the Contractor with a specific description of the Work to be performed utilizing the allowance.
- B. The Contractor shall not utilize a Lump Sum Allowance or any portion of a Lump Sum Allowance for performing any base scope Work described elsewhere in the Contract Documents including any materials, labor, or related portions of the Work described in this Section.
- C. Upon receipt of the directive or Field Order, the Contractor shall immediately incorporate the Lump Sum Allowance Work into the project schedule.

1.7 UNIT-COST ALLOWANCES

- A. A Unit-Cost Allowance shall include cost to Contractor of specific products and materials selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.8 QUANTITY ALLOWANCES

- A. The Architect will notify the Contractor of the intent to utilize a Quantity Allowance in any quantity deemed necessary, as determined by the Architect, to perform the Work. The contractor will immediately proceed with the Work identified in the notification.
- B. The Contractor shall not utilize a Quantity Allowance or any portion of a Quantity Allowance for performing any base scope Work described elsewhere in the Contract Documents including any materials, labor, or related portions of the Work described in this Section.

1.9 PAYMENT PROCEDURES

- A. Contractor's overhead, profit, and related costs for products and equipment are included in the allowance and are part of the Contract Sum. These costs include materials, labor, freight, delivery, installation, taxes, insurance, equipment rental and similar costs.
- B. At Project Closeout, or earlier if so directed by Architect, the dollar value of any remaining, unused Allowances shall be credited to the Owner by Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

TOC | South Cary Water Reclamation Facility – Maintenance Facility with Solar

Quantity Allowances - See Division 01 Section “Unit Prices” for complete descriptions of Work included under applicable Allowances.

Item	Description	Unit	Allowance Quantity
Q-C1	Rock removal in Open Areas (Mass Rock) and disposal off-site.	Each Cubic Yard	10 CY
Q-C2	Rock removal in Trenches and Pits (Trench Rock) and disposal off-site.	Each Cubic Yard	20 CY
Q-C3	Unsuitable soils removal and disposal off-site	Each Cubic Yard	300 CY
Q-C4	Replacement of removed rock or unsuitable soils with off-site suitable soil in-place.	Each Cubic Yard	50 CY
Q-C5	Replacement of removed rock or unsuitable soils with Aggregate Base Course in-place.	Each Cubic Yard	200 CY
Q-C6	Replacement of removed rock or unsuitable soils with No.57 washed stone in-place.	Each Cubic Yard	50 CY
Q-C7	Biaxial Geo-Grid in place	Each Square Yard	100 SY
Q-S1	PEMB footing concrete.	Each Cubic Yard	60 CY
Q-S2	PEMB footing reinforcing.	Weight (lbs)	3,000 LBS

END OF SECTION 012100

SECTION 012200 – UNIT PRICES

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 unit prices.
- B. Related Sections:
 - 1. Division 01 Section "Modification Procedures" for procedures for submitting and handling Change Proposals and Change Orders.
 - 2. Division 01 Section "Allowances" for procedures for using unit prices to adjust Quantity Allowances.

1.3 DEFINITIONS

- A. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary materials and labor, plus cost for delivery, freight installation, insurance, applicable taxes, overhead, and profit.
- B. The unit price provided by the Contractor shall be used for Work added or deducted to the contract.
- C. The Owner reserves the right to revise the quantities (increase or decrease) listed in the Allowances for any unit price Work utilizing the unit cost provided by the Contractor on the Bid Form.
- D. Unit prices shall apply throughout the life of the Contract, except as otherwise specifically noted.
- E. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- F. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the Part 3 "Schedule of Unit Prices" Article contain requirements for materials described under each unit price. Bidders shall respond to the schedule by writing the applicable costs on the appropriate Bid Form for each identified unit cost.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price No. Q-C1: Rock removal in Open Areas (Mass Rock) and disposal off-site.
 - 1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 - 2. Unit of measurement: cubic yard measured before removal.
 - 3. Include the following in the unit price:
 - a. Excavation, loading, transport, and legal disposal of all materials.
 - b. All disposal fees.
 - c. Overhead and profit.
 - 4. Include all other related costs in the contract sum.
 - 5. Method of measurement: Quantities will be verified by a soils and materials engineer employed by the Owner.

- B. Unit Price No. Q-C2: Rock removal in Trenches and Pits and disposal off-site.
 - 1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 - 2. Unit of measurement: cubic yard measured before removal.
 - 3. Include the following in the unit price:
 - a. Excavation, loading, transport, and legal disposal of all materials.
 - b. All disposal fees.
 - c. Overhead and profit.
 - 4. Include all other related costs in the contract sum.
 - 5. Method of measurement: Quantities will be verified by a soils and materials engineer employed by the Owner.

- C. Unit Price No. Q-C3: Unsuitable soils removal and disposal off-site.
 - 1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 - 2. Unit of measurement: cubic yard measured before removal.
 - 3. Include the following in the unit price:
 - a. Excavation, loading, transport, and legal disposal of all materials.
 - b. All disposal fees.
 - c. Overhead and profit.
 - 4. Include all other related costs in the contract sum.
 - 5. Method of measurement: Quantities will be verified by a soils and materials engineer employed by the Owner based on volume of excavation.

- D. Unit Price No. Q-C4: Replacement of removed rock or unsuitable soils with off-site suitable soil in-place.
 - 1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 - 2. Unit of measurement: cubic yard of void to be filled.
 - 3. Include the following in the unit price:
 - a. Suitable soil materials from contractor's off-site source.
 - b. Excavation, loading, transport, placement and compaction of soil into void remaining from removed rock or unsuitable soil.
 - c. Overhead and profit.

4. Include all other related costs in the contract sum.
 5. Include costs related to removal of rock or unsuitable soil in other Unit Prices.
 6. Method of measurement: Quantities will be verified by a soils and materials engineer employed by the Owner based on volume of void to be filled.
- E. Unit Price No. Q-C5: Replacement of removed rock or unsuitable soils with Aggregate Base Course in-place.
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Unit of measurement: cubic yard of void to be filled.
 3. Include the following in the unit price:
 - a. Certified ABC materials from contractor’s off-site source.
 - b. Excavation, loading, transport, placement and compaction of ABC into void remaining from removed rock or unsuitable soil.
 - c. Overhead and profit.
 4. Include all other related costs in the contract sum.
 5. Include costs related to removal of rock or unsuitable soil in other Unit Prices.
 6. Method of measurement: Quantities will be verified by a soils and materials engineer employed by the Owner based on volume of void to be filled.
- F. Unit Price No. Q-C6: Replacement of removed rock or unsuitable soils with No.57 washed stone in-place.
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Unit of measurement: cubic yard of void to be filled.
 3. Include the following in the unit price:
 - a. Certified #57 washed stone from contractor’s off-site source.
 - b. Excavation, loading, transport, placement and compaction of #57 washed stone into void remaining from removed rock or unsuitable soil.
 - c. Overhead and profit.
 4. Include all other related costs in the contract sum.
 5. Include costs related to removal of rock or unsuitable soil in other Unit Prices.
 6. Method of measurement: Quantities will be verified by a soils and materials engineer employed by the Owner based on volume of void to be filled.
 7. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Division 01 Section “Allowances.”
 8. **Allowance: 50-CY.**
- G. Unit Price No. 8: Biaxial Geo-Grid in place.
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Unit of measurement: square yard of surface to be covered.
 3. Include the following in the unit price:
 - a. Materials and transport to site.
 - b. Unloading, handling, and placement.
 - c. Overhead and profit.
 4. Include all other related costs in the contract sum.
 5. Method of measurement: Quantities will be verified by a soils and materials engineer employed by the Owner based on the area of ground covered by the fabric. Excess and/or overlap shall not be included in the measurement.
 6. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Division 01 Section “Allowances.”
 7. **Allowance: 100-SY.**

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SECTION 012600 – CONTRACT MODIFICATION 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 work specified in this section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. “Supplementary Conditions” for copies of Owner-generated Change Forms.
 - 2. Division 01 "Product Requirements" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 FIELD ORDERS

- A. Field Orders are issued by the Architect to interpret/clarify the Contract Documents, order minor changes in the work, and/or memorialize trade-off agreements, not involving an adjustment to the Contract Sum or Contract Time. Field Orders will be issued on an Owner-generated form.

1.4 CHANGE ORDER PROPOSAL REQUESTS

- A. Owner-Initiated Change Order Proposal Requests: Proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time will be issued by the Architect, with a description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.
 - 1. Proposal requests issued by the Architect are for information only. Do not consider them an instruction either to stop work in progress, or to execute the proposed change.
 - 2. Unless otherwise indicated in the proposal request, within 10 days of receipt of the proposal request, submit to the Architect for the Owner's review an estimate of cost necessary to execute the proposed change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- e. Quotation Form: Use Contractor-generated form acceptable to Architect, with check boxes for Change Categories (ie Owner Request, Concealed Condition, Designer Request, etc).
 3. Comply with the requirements in Division 01 Section "Product Requirements" if the proposed change in the Work requires the substitution of one product or system for a product or system specified.
- B. Contractor-Initiated Change Order Proposal Requests: If latent or other unforeseen conditions are believed to require modifications to the Contract, the Contractor shall submit a Request For Information (RFI) to the Architect. As determined by the RFI and response process, as described in Division 01 Section "Project Management and Coordination," the Architect may elect to initiate a Request for Proposal (RFP).
1. Proposal requests issued by the Architect are for information only. Do not consider them an instruction either to stop work in progress, or to execute the proposed change.
 2. Unless otherwise indicated in the proposal request, within 10 days of receipt of the proposal request, submit to the Architect for the Owner's review an estimate of cost necessary to execute the proposed change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use Contractor-generated form acceptable to Architect, with check boxes for Change Categories (ie Owner Request, Concealed Condition, Designer Request, etc).
 3. Comply with the requirements in Division 01 Section "Product Requirements" if the proposed change in the Work requires the substitution of one product or system for a product or system specified.

1.5 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Change Order Proposal Request, the Architect will issue a Change Order on Owner-generated form for signatures of the Owner and Contractor, as provided for in the Conditions of the Contract. Accompanying the form will be copies of all required pertinent and complete data from the Contractor, submitted as previously stated.

1.7 WORK CHANGE DIRECTIVE

- A. Construction Change Directive: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Architect may issue a Work Change Directive on Owner-generated form, instructing the Contractor to proceed with a change in the Work, for Subsequent inclusion in a Change Order.

1. The Work Change Directive will contain a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contact Sum or Contract Time.
- B. Documentation: Maintain detailed records on time and material basis of work required by the Work Change Directive.
 1. After completion of this change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION 012600

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SECTION 012900 - PAYMENT 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 administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. "Supplementary Conditions" for Owner-generated forms.
 - 2. Division 01 Section "Allowances" for procedural requirements governing the handling and processing of allowances.
 - 3. Division 01 Section "Unit Prices" for administrative requirements governing the use of unit prices.
 - 4. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 5. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's construction schedule.
 - 1. Submit the Schedule of Values to Architect at earliest possible date, but no later than 30 calendar days after the Notice to Proceed.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Owner's name.
 - c. Owner's project number.
 - d. Name of Architect.
 - e. Architect's project number.
 - f. Contractor's name and address.

- g. Date of submittal.
- 2. Arrange Schedule of Values in tabular form consistent with format of AIA Document G703. Column for Item Number shall be represented by Related Specification Section.
- 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
- 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
- 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
- 6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- 7. Change Orders: Provide a separate line item in the schedule of values for each approved Change Order.
- 8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
- 9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and Final Application for Payment involve additional requirements.
- B. Payment Application Times: Submit Application for Payment to Architect by the 5th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
 - 1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C. Application for Payment Forms: Use Owner-generated forms for Applications for Payment. Refer to “Supplementary Conditions” for copies of forms.
 - 1. With each Application for Payment, submit the following with the Owner Project ID Number on each document:
 - a. Progress Payment Cover Letter.
 - b. Town of Cary Cover Sheet.
 - c. Itemized Quantity Sheets.
 - d. Certificate of Sales Tax Paid.

- e. Updated Project Construction Schedule.
 - f. Current Insurance Certificate.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
- 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders issued before last day of construction period covered by application.
 - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site. Refer to General Conditions of the Contract for Construction, Paragraph 9.3.2.
- 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 - 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three original signed and notarized copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours.
- 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
- 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - 2. When an application shows completion of an item, submit conditional final or full waivers.
 - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - 4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Schedule of unit prices.
 5. Submittal schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of preconstruction conference.
 12. Certificates of insurance and insurance policies.
 13. Performance and payment bonds.
 14. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After date of Substantial Completion has been established, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Beneficial Occupancy or Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit Final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.
 10. Proof that taxes, fees, and similar obligations are paid.
 11. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

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 provisions for coordinating construction operations on Project including, but not limited to, the following:

- 1. General coordination procedures.
- 2. Coordination drawings.
- 3. Requests for Information (RFIs).
- 4. Digital project management procedures.
- 5. Project meetings.

- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

- C. Related Requirements:

- 1. Division 01 Section "Summary" for specific restrictions related to performance of the Work.
- 2. Division 01 Section "Payment Procedures" for preparing and submitting the Schedule of Values.
- 3. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
- 4. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
- 5. Division 01 Section "Construction Waste Management and Disposal" for proper procedures in disposal, salvage and recycling.
- 6. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI (Request for Information): 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 entities performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.
- B. Key Personnel Names: Within 14 days after Notice to Proceed, 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 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, and in temporary field office. Keep list current at all times.
- C. Emergency Contact List: Not later than 24 hours after Notice to Proceed or at Pre-Construction Meeting, Contractor shall distribute an Emergency Contact List. At a minimum, the list will contain each person's name, daytime telephone number, night phone number, email address, and text number if applicable. For each company the minimum information will be the contact information listed above for each key person involved in the work (project manager and superintendent at a minimum), the business name, the business phone number, physical address and email address. At a minimum, this information is required for the following subcontractors:
1. Utility
 2. Grading
 3. Foundations
 4. Plumbing
 5. Mechanical
 6. Electrical
- D. Project Logistics Plan: Not later than 7 days after Notice to Proceed or at Pre-Construction Meeting, Contractor shall distribute Project Logistics Plan. Contractor will adjust the plan per Owner or Architect recommendations and requirements prior to commencing work on site. After acceptance of Project Logistics Plan, perform construction operations in compliance with accepted plan, unless deviations are accepted by the Owner in writing. Incorporate Project Logistics Plan elements into Construction Schedule. At a minimum, the plan will document the following:
1. Date of proposed implementation. (Proposed start date and likely duration.)
 2. Map of project work limits, and proposed staging/lay-down and construction personnel parking areas; phased as necessary.
 3. Protection and remediation plans for existing hardscape and landscape.
 4. Plan for safe management of pedestrian and vehicular traffic around construction activity.
 5. Safety fencing, barricades, and temporary facilities or services.
 6. Planned utility outages.
 7. National Training Complex Calendar of Events.
- E. Preliminary Schedule of Maintenance Materials: Not later than 90 days after Notice to Proceed, Contractor shall create a consolidated preliminary schedule of maintenance (extra) materials identified in other Sections and shall submit to Architect for review. Refer to Division 01 Section "Closeout Procedures" for requirements of Final Schedule of Maintenance Materials. At a minimum the preliminary schedule will document the following:
1. Specification Section number and title.
 2. General product description.
 3. Manufacturer name and model number.
 4. Quantity of extra material to be delivered to the Owner at Project Closeout, listed as a deliverable unit (i.e. boxes, cartons, fixtures, etc).

- F. Photo and/or Video Documentation of Existing Conditions: Not later than 2 days after Notice to Proceed, Contractor shall submit documentation of the existing conditions surrounding the Limits of Construction, the anticipated construction traffic access paths on the Owner’s Property, and out to the public-access entrance to the Owner’s Property with a series of labeled and dated photos and/or video footage. The documentation shall clearly represent the existing conditions at the onset of Construction Activities. Contractor shall submit photo and/or video documentation to Owner and Architect for record.
 - 1. Photo and/or video documentation shall be utilized for repair of existing conditions to remain should damage occur due to construction activities.

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.
 - 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 and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. 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. Construction of integrated exterior mockup wall.
 - 6. Progress meetings.
 - 7. Preinstallation conferences.
 - 8. Startup and adjustment of systems.
 - 9. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
 - 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

- B. Coordination Drawing Organization: Organize coordination drawings as follows:
 - 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 - 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 - 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 - 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 - 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 - 6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.

- b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 9. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
- C. Coordination Drawing Process: Prepare coordination drawings in the following manner:
1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
 2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
 3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
 4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
 5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
 6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
 7. Contractor shall perform the final coordination review.
- D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Submittal Format: Submit or post coordination drawing files using PDF format.
- 1.7 REQUESTS FOR INFORMATION (RFIs)
- A. General: Immediately on discovery of the need for additional information or interpretation of the 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. Owner's name.
 3. Owner's Project number.
 4. Date.
 5. Name of Contractor.
 6. Name of Architect.
 7. RFI number, numbered sequentially.
 8. RFI subject.
 9. Specification Section number and title and related paragraphs, as appropriate.
 10. Drawing number and detail references, as appropriate.
 11. Field dimensions and conditions, as appropriate.
 12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 13. Contractor's signature.
 14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Contractor-generated form with content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) calendar days for Architect's response for each RFI.
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 by Architect 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 Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within five (5) calendar days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and distribute a tabular log of RFIs organized by the RFI number. Provide log with not less than the following information:
1. Project name and number.

2. Name and address of Architect and Contractor.
 3. RFI number, including RFIs that were returned without action or withdrawn.
 4. RFI description, including response when available.
 5. Date the RFI was submitted.
 6. Date Architect's response was received.
 7. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. 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 three (3) calendar days if Contractor disagrees with response.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links and/or bookmarks enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
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 a minimum of seven (7) days prior to meeting.
 2. Schedule meetings to occur on the same day of the week at the same time of day at the prescribed intervals. At commencement of the project the day and time of the meeting will be discussed with the Owner and Architect. If a consensus cannot be reached regarding the day and time of the meetings the Architect will choose the day and time that accommodates the greatest number of meeting stakeholders.
 3. Meetings will be held on the agreed upon day and time at the required intervals unless agreed upon in advance by all parties to revise the meeting day and/or time either for a single occurrence or for the remainder of the project.
 4. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 5. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, and Architect, within three (3) business days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference(s) before starting construction, at a time convenient to Owner and Architect.
1. Attendees: Authorized representatives of Owner, 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. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Weekly progress meetings.
 - d. Critical work sequencing and long-lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Procedures for processing field decisions and Change Orders.
 - h. Procedures for RFIs.
 - i. Procedures for testing and inspecting.
 - j. Procedures for processing Applications for Payment.
 - k. Distribution of the Contract Documents.
 - l. Submittal procedures.
 - m. Sustainable design requirements.
 - n. Preparation of record documents.
 - o. Use of the premises.
 - p. Work restrictions.
 - q. Working hours.
 - r. Decorum on construction site.
 - s. Owner's occupancy requirements.
 - t. Responsibility for temporary facilities and controls.
 - u. Procedures for moisture and mold control.
 - 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. Safety and first aid.
 - bb. Security.
 - cc. Progress cleaning.
 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct preinstallation conferences at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
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 authorized representatives of the Owner and Architect, of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Related RFIs.
 - c. Related Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Sustainable design requirements.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.

- l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. 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.
- D. Progress Meetings: Conduct progress meetings at weekly intervals.
 1. Attendees: In addition to representatives of Owner, and Architect and their consultants, each subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with 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 so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Review schedule for next period.
 - 1) For reports of Work Completed and Work Projected, use 7-day periods at regular weekly progress meetings.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Status of proposal requests.
 - 2) Pending changes.
 - 3) Pending claims and disputes.
 - 4) Status of Change Orders.
 - 5) Status of RFIs.
 - 6) Status of submittals.

- 7) Construction/coordination issues, including but not limited to:
 - a) Interface requirements.
 - b) Sequence of operations.
 - c) Deliveries.
 - d) Off-site fabrication.
 - e) Access.
 - f) Site utilization.
 - g) Temporary facilities and controls.
 - h) Progress cleaning.
 - i) Quality and work standards.
 - j) Status of correction of deficient items.
 - 8) Field observations.
 - 9) Special Inspection reports/discrepancy notices.
 - 10) Documentation of information for payment requests. Provide draft copy for Designer review at stipulated interval prior to Application for Payment submittal to Owner.
 - 11) Comments from Contractor, Architect, Engineer, Owner.
- c. On a monthly interval, or more frequently as necessary, distribute copies of the following:
- 1) Current Construction Schedule.
 - 2) Current PCO/Change Order Log.
 - 3) Current RFI Log.
 - 4) Current Submittals Log.
3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

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 documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Site condition reports.
5. Unusual event reports.

- B. Related Requirements:

1. Division 01 Section "Payment Procedures" for preparing and submitting the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for schedule update requirements related to weekly and monthly progress meetings.
3. Division 01 Section "Submittal Procedures" for requirements of incorporating submittal review times into the Contractor's Construction Schedule.
4. Division 01 Section "Quality Requirements" for maintaining a log of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

- A. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.

- B. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

- C. Event: The starting or ending point of an activity.

- D. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- E. Milestone: A key or critical point in time for reference or measurement.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF file.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
 - 2. Make corrections noted by Architect and resubmit final schedule for approval.
- C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
- D. Construction Schedule Updating Reports: Submit with Applications for Payment, and on a monthly interval at Weekly Progress Meetings.
- E. Daily Construction Reports: Submit at monthly intervals.
- F. Site Condition Reports: Submit at time of discovery of differing conditions.
- G. Unusual Event Reports: Submit at time of unusual event.

1.5 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
- B. Time Frame: Extend schedule from date established for the Notice to Proceed 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. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 14 calendar days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following 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.
 - a. Include Owner-supplied materials.
 - b. Includes items of Work in the Schedule of Allowances
 3. Submittal Review Time: Include critical path and long-lead item review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule.
 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.
- D. Constraints: 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 Owner: Include a separate activity for each portion of the Work performed by Owner.
 3. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Uninterruptible services.
 - b. Partial occupancy before Substantial Completion.
 - c. Use-of-premises restrictions.
 - d. Seasonal variations.
 - e. Environmental control.
 4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

- a. Submittals.
 - b. Mockups.
 - c. Fabrication.
 - d. Sample testing.
 - e. Installation.
 - f. Tests and inspections.
 - g. Curing.
 - h. Building flush-out.
 - i. Startup and placement into final use and operation.
 - j. Commissioning.
5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
- a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion, and the following interim milestones:
1. Temporary enclosure.
 2. Space conditioning.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.
- G. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the 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 Final Completion percentage for each activity.
- H. Recovery Schedule: When periodic update indicates the Work is 5 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished. Upon approval by the Owner and Architect, the Recovery Schedule shall become a part of the Schedule. All costs related to the preparation of any Recovery Schedule shall be borne by the Contractor.
1. If the Contractor falls five (5) calendar days behind on any activity on the critical path shown on the Schedule or, if it becomes apparent from the Schedule that the Work might not be completed

within the Contract Time or milestone dates might not be achieved as scheduled, the Contractor agrees to take, at no additional cost to the Owner, some or all of the following actions to recover the Schedule:

- a. Increase the number of employees in such trades as shall regain lost schedule progress.
 - b. Increase the number of working hours per shift, shifts per working day, working days per week, amount of equipment or any combination of the foregoing to regain lost schedule progress.
2. Should any revision of any Progress Schedule show that the Contractor is behind so that, without increasing his rate of performance, he will not complete any activity, the late completion of which could delay Substantial Completion of the Work, the Owner shall be entitled to withhold from the next Progress Payment due the Contractor an amount not exceeding the amount the Owner would be entitled to in Liquidated Damages, should the Contractor delay Substantial Completion by the same number of days as he is behind, as shown in the most recent update/revision to the Progress/Schedule. Withholding of such funds shall be under the provisions of the General Conditions of the Contract, Article 9, Paragraph 9.5.1.6. If, subsequently, the Contractor's progress, as shown by a succeeding revision to the Progress Schedule, is such that the anticipated delay no longer exists, the Owner shall pay with the Progress Payment next due to the Contractor such amounts as have been withheld in accordance with this paragraph.
 3. Failure of the Contractor to comply with the requirements of the Recovery Schedule, or the Contractor's failure to diligently prosecute the Work so as to ensure its completion within the Contract Time, is sufficient grounds to constitute a substantial breach of the Contract Documents.
- I. Proposed Extensions in Contract Time: Any request for extension of Contract Time shall include a proposed revised CPM Construction Schedule showing how the requested time extension alters the approved CPM Construction Schedule. The Contractor shall prepare the revised schedule, which must clearly display that the Contractor has used, in full, all of the float time available for the work involved in this request. The cost of such preparation will be borne by the Contractor. Upon approval by the Architect and Owner, the proposed revised schedule will be incorporated into the CPM Construction Schedule.
1. Further, the Contractor specifically agrees that there will be no basis for an extension of Contract Time, or a claim for additional compensation as a result of any project Change Order or delay which only results in the loss of available positive float in activities of the approved Construction Schedule.
 2. If the Contractor at any time knows or has reason to believe that the delivery of any item of material or equipment or the storage of qualified labor or delays caused by others or the occurrence of any other difficulty may cause a delay in carrying out the approved Order of Construction or the Progress Schedule, he shall notify the Architect in writing within three (3) days.
 3. Any work necessary to be performed after regular hours, on Sundays, or Legal Holidays, shall be performed without additional expense to the Owner, unless it is a Change in Work with an approved Time Extension or acceleration.
- J. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules 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.

1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule prior to issuance of first legitimate Application for Payment.
 - 1. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.8 CPM SCHEDULE REQUIREMENTS

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. CPM Schedule: Prepare Contractor's Construction Schedule using a time-scaled CPM network analysis diagram for the Work.
 - 1. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 2. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and inspection.
 - j. Commissioning.
 - k. Punch list and Final Completion.
 - l. Activities occurring following Final Completion.
 - 2. 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.
 - 3. 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.
 - 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

- a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
 - 1. Subcontractor and the Work or activity.
 - 2. Description of activity.
 - 3. Main events of activity.
 - 4. Immediate preceding and succeeding activities.
 - 5. Early and late start dates.
 - 6. Early and late finish dates.
 - 7. Activity duration in workdays.
 - 8. Total float time.
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 - 1. Identification of activities 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 time.
 - 7. Changes in the Contract Time.

1.9 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. Approximate count of personnel at Project site.
 - 3. Equipment at Project site.
 - 4. Material deliveries.
 - 5. High and low temperatures and general weather conditions, including presence of rain or snow.
 - 6. Testing and inspection.
 - 7. Accidents.
 - 8. Meetings and significant decisions.
 - 9. Unusual events.
 - 10. Stoppages, delays, shortages, and losses.
 - 11. Meter readings and similar recordings.
 - 12. Emergency procedures.
 - 13. Orders and requests of authorities having jurisdiction.
 - 14. Change Orders received and implemented.
 - 15. Field Orders received and implemented.
 - 16. Construction Change Directives received and implemented.
 - 17. Services connected and disconnected.
 - 18. Equipment or system tests and startups.
 - 19. Partial completions and occupancies.
 - 20. Substantial Completion authorized.

- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- C. Unusual Event Reports: 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, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
 - 1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to Architect and parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

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:

- 1. Submittal schedule requirements.
- 2. Administrative and procedural requirements for submittals.

- B. Related Requirements:

- 1. Division 01 Section "Contract Modification Procedures" for submitting change proposals.
- 2. Division 01 Section "Payment Procedures" for preparing and submitting Applications for Payment and the Schedule of Values.
- 3. Division 01 Section "Project Management and Coordination" for distributing and posting coordination drawings.
- 4. Division 01 Section "Construction Progress Documentation" for submitting construction schedules and reports.
- 5. Division 01 Section "Quality Requirements" for submitting test and inspection reports, schedule of tests and inspections, and requirements of mock-ups.
- 6. Division 01 Section "Product Requirements" for submitting product substitutions.
- 7. Division 01 Section "Execution" for submitting surveys.
- 8. Division 01 Sections "Warranties", "Roof Warranties", and "Closeout Procedures" for submitting warranties, Project Record Documents, and operation and maintenance manuals.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.
- 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.

1.4 SUBMITTAL LOG

- A. Submittal Log: Submit, as an action submittal, a list of submittals, arranged in order of Specification Section.

1. Initial Submittal Log shall be submitted to Architect within 14 calendar days after Notice to Proceed, including all submittals required by the Project Manual.
2. Format: Arrange the following information in a tabular format:
 - a. Submittal Name and Number utilizing Specification Section title and number, and sequential numbers representing the submittals required by the Specification Section. Original submittal shall accompany the suffix “.0”, whereas any subsequent revisions shall carry the suffix “.1” and “.2”, etc. Submittal Number format example:
 - 1) 084113-1.0 Aluminum-Framed Storefront and Entrances Product Data, to include Sustainable Design Product Data, manufacturer’s printed color chart, installer qualification data, energy performance certificates, product test reports, and sample warranties.
 - 2) 084113-2.0 Aluminum-Framed Storefront and Entrances Shop Drawings, to include Delegated Design signed and sealed analysis data.
 - 3) 084113-3.0 Aluminum-Framed Storefront and Entrances Samples, once color selection options have been narrowed down by Architect using printed color chart.
 - 4) 084113-4.0 Aluminum-Framed Storefront and Entrances Installation Instructions.
 - 5) 084113-5.0 Aluminum-Framed Storefront and Entrances Maintenance data.
 - b. Submittal category: Action; informational.
 - c. Name of subcontractor.
3. Submittal requirements shall be grouped together into reasonable submittal groupings, as indicated in the Submittal Number format example above. As much as possible, all submittal groupings per Specification Section shall be submitted to Architect at the same time, with the exception of color samples.
4. General Contractor shall remain aware of submittal timing to maintain orderly progress of the Work and aware of submittals that require early submission because of long lead time for manufacture or fabrication. Maintaining orderly progress of the Work shall include accounting for time required for review, ordering, manufacturing, fabrication, and delivery, including additional time required for making corrections or revisions to submittals noted by Architect, and additional time for handling and reviewing submittals required by those corrections.
5. Revise and resubmit Submittal Log, incorporating Architect’s comments, within 7 calendar days of receipt of Architect’s comments. Approved Submittal Log shall be utilized to track submittal progress, including submission, return, and distribution dates, and action status of each submittal.

1.5 SUBMITTAL FORMATS

- A. Transmittal Form for Electronic Submittals: Use software-generated form containing the following information:
 1. Project name.
 2. Date.
 3. Name of Architect.
 4. Name of Contractor.
 5. Name of firm or entity that prepared submittal.
 6. Names of subcontractor, manufacturer, and supplier.
 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 8. Category and type of submittal.
 9. Drawing number and detail references, as appropriate.
 10. Indication of full or partial submittal.
 11. Location(s) where product is to be installed, as appropriate.
 12. Other necessary identification.
 13. Remarks.
 14. Signature of transmitter.

- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
 - 1. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect or Engineer.
- E. Non-Electronic Submittals:
 - 1. Place a permanent label on each submittal item for identification; include name of firm or entity that prepared submittal.
 - 2. Provide a space approximately **6 by 8 inches (150 by 200 mm)** on label or transmittal to record Contractor's review and approval markings and action taken by Architect.
 - 3. Action Submittals: Submit five copies of each submittal unless otherwise indicated. Architect will retain two copies.
 - 4. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using transmittal form.

1.6 SUBMITTAL PROCEDURES

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.
- B. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
 - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 - 2. Non-Electronic: Prepare submittals with paper transmittal form and deliver to Architect.
- 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. 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.
 - b. Provide all interior finish submittals, including samples, at one time for Designer and Owner review and selection.
 - c. Provide all exterior finish submittals, including samples, at one time for Designer and Owner review and selection.
- D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 14 calendar 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 14 calendar days for review of each resubmittal.
 4. Allow time for mockup construction, review and approval when allotting time for submittals related to components required in mockups. See Division 01 Section "Quality Requirements" for requirements of mockups. Products required in mockups are indicated in individual Specification Sections.
- E. 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. Provide a complete submittal as the resubmittal, including information acceptable in the original submittal or previous resubmittal.
 4. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- F. 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.
- G. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with "No Exception Taken" or "Make Corrections Noted" notation from Architect's action stamp or similar from Engineer's action stamp.
- H. Submittals Log: Prepare, maintain, and distribute a tabular log of submittals organized by the submittal number. Provide log with not less than the following information:
1. Project name and number.
 2. Name and address of Architect.
 3. Submittal number, including submittals that were returned without action or withdrawn.
 4. Submittal description.
 5. Submittal category (i.e. Product Data, Show Drawings, Samples, etc).
 6. Entity that created the submittal.
 7. Date Contractor received submittal from subcontractor.
 8. Date the submittal was sent to the Architect.

9. Date the submittal was returned to the Contractor.
10. Date returned submittal was forwarded to the subcontractor.
11. Action stamped on submittal by Architect, Engineer or Owner.
12. Entity that reviewed the submittal (i.e. Architect, Engineer, Owner, etc).

- I. On receipt of returned submittal, update the Submittal Log and immediately distribute the submittal to affected parties.

1.7 SUBMITTAL REQUIREMENTS

- A. 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. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. 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.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
- C. Samples: Submit Samples directly to Architect's office for review of type, color, pattern, and texture for a check of these characteristics with other materials 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. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. 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. Returned samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. 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 five (5) full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will retain two (2) sets, remainder will be returned.
 6. 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 five (5) sets of Samples. Architect will retain two (2) Sample sets; remainder will be returned.
 - 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 three (3) sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- E. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- F. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

- G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- H. Closeout Submittals, Maintenance Data, and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
- I. Sustainability Submittals: Comply with requirements specified in Division 01 Section "Sustainability Requirements."
- J. 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.
- K. 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 AWS forms. Include names of firms and personnel certified.
- L. 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.
- M. 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.
- N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- P. 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.
- Q. Product Test Reports: Submit written reports indicating that 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.
- R. 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.
 - 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.
- S. 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.

- T. 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.
- U. Field Test Reports: Submit written 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.
- 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.

1.8 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, 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.

1.9 CONTRACTOR'S REVIEW

- A. Action Submittals 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. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform, approval stamp. Include 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.
 - 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. 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.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents may be returned by the Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

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SECTION 014000 - QUALITY 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 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 Requirements:
 - 1. Division 01 Section "Execution" for construction layout, field engineering and surveying, installation, cleaning and protection.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as a 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(s).
- D. 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.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- F. Product Tests: 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.
 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.
- G. 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.
- H. 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.
- I. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- J. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: 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 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 1. Indicate manufacturer and model number of individual components.

2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. 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.
- C. Reports: Prepare and submit certified written reports and documents as specified.
- 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.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan 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 and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- C. Testing and Inspection: In quality-control plan, include 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. Distinguish source quality-control tests and inspections from field quality-control 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.
- D. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- E. 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.

1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections, in duplicate to Architect except as otherwise indicated, and submit copies directly to governing authorities where required or requested. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.

- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, and telephone number of technical representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.

- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, and telephone number of factory-authorized service representative making report.
 - 2. Statement that equipment complies with requirements.
 - 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 4. Statement whether conditions, products, and installation will affect warranty.
 - 5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located – **the State of North Carolina** – 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 in material, design, and extent to those indicated for this Project.
- F. 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.
- G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. 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. When testing is complete, remove test specimens, assemblies, 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 and Commissioning Authority, 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.

- J. 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 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.
- K. Integrated Exterior Mockups: Construct integrated exterior mockup according to reviewed Shop Drawings and as indicated on Drawings. Coordinate installation of exterior envelope materials and products to be integrated into Exterior Mockup as required in individual Specification Sections, along with supporting materials.
1. Locate mockup as directed by Architect.
 2. See Drawings for mockup details.
 3. Build mockup for typical exterior walls, including face veneer masonry and metal panels, backup wall construction, rigid insulation, air barrier, veneer anchors, flashing and weep holes, sealant, coping, drip edge, and glazed openings.
 - a. Include sealant options for storefront intersection with masonry.
 - b. Include sealant options for masonry control joint.
 - c. Include sealant options for metal panel.
 - d. Include 2 colors of brick.
 - e. Include 2 colors of mortar.
 - f. Include 2 colors of metal panel.
 - g. Include 1 color of metal coping.
 - h. Include 1 color of expansion joint flashing cover.
 - i. Include wood blocking.
 4. Clean exposed faces of mockups with masonry cleaner as indicated.
 5. Notify Architect seven days in advance of dates and times when mockups will be constructed. After Architect's review make repairs and corrections to mock-ups as directed by Architect.
 6. Protect accepted mockups from the elements with weather-resistant membrane. Maintain protected mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Approval of mockups is for color, texture, blending of masonry units, and relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of masonry workmanship. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 8. Demolish and remove mockups when directed.

1.10 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, and the Contract Sum will be adjusted by Change Order.

- 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. It is the Contractors responsibility to contact the Owners testing agency for all required tests. The Contractor shall contact the testing agency at the times and interval as set forth in this Project Manual and initiate the required tests with sufficient advance notice to allow the testing agency to schedule the inspections.
 - 2. 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.
 - 3. 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.
 - 4. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 5. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 6. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 7. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

- C. 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.

- D. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Agent and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect, Commissioning Agent, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a 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.
- E. **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 "Submittals."
- F. **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.
- G. **Contractor's Associated Requirements and 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.
- 1.11 **SPECIAL TESTS AND INSPECTIONS**
- A. **Special Tests and Inspections:** Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections, 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 Contractor, with copy to Architect and to authorities having jurisdiction.
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. Test and Inspection Log: Prepare a record of tests and inspections performed either by Owner-engaged testing agency or Contractor-engaged testing agency. 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 revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.
 1. Submit log at Project closeout as part of Project Record Documents.

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

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

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 temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

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

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

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 United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

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. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.
- B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide galvanized-steel bases for supporting posts.
- C. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.

2.2 TEMPORARY FACILITIES

- A. Common-Use Field Office: Of sufficient size to accommodate needs of 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. Conference room 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.
 - 2. Drinking water.
 - 3. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
 - 4. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- 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.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 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.
 - 1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
- 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.

3.3 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. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to private system indicated as directed by authorities having jurisdiction.
- C. 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.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash 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. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.
- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity.
 - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
 - 2. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

3. HVAC Equipment: Owner authorizes use of permanent HVAC system for temporary use during construction.
 - a. Permanent HVAC System: 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 Division 01 Section "Closeout Procedures."
- F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
 1. Connect temporary service to Owner's existing power source, as directed by 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.
- H. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
 1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Division 31 Section "Earth Moving."
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
 3. Comply with requirements in Division 01 Section "Traffic Control."
- D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- E. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.

2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touch up signs, so they are legible at all times.
- H. Existing Signage: Existing signage affected by Project construction is the responsibility of the Contractor.
1. Coordinate with Owner and Architect to verify if signage should be kept in use throughout the construction process.
 2. Remove or cover signage as necessary to ensure lack of confusion and safety of public.
 3. Where possible, re-install or uncover signage as work progresses to maintain effective public information.
 4. After construction is complete re-install or uncover signage promptly.
 5. Restore signage to equal or better condition as existed prior to construction.
- I. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

3.5 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 regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with pollution and environmental control requirements of authorities having jurisdiction.
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent, and requirements indicated on Drawings and specified in Division 01 Section " Temporary Erosion and Sediment Control."
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
1. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain necessary pumping equipment.
 2. As indicated on Drawings, construct temporary cofferdam and pump station to dewater Site for improvements to existing storm water pond. Maintain temporary facilities until construction is complete.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

1. Unless indicated otherwise on Drawings, provide 4-foot-high barriers around drip lines, with access for maintenance.
 2. Replace trees and plants damaged by construction operations.
- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering Project site except by lockable entrance gates.
1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- H. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- I. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
 2. Paint and maintain appearance of walkway for duration of the Work.
- J. 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.
- K. 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. Comply with additional limits on smoking specified in other Sections.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with 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.

3.6 MOISTURE AND MOLD CONTROL

- A. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
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.

- B. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard and replace stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

- C. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 DUST CONTROL

- A. Execute Work by methods that minimize raising dust from construction operations.
- B. Provide positive means to prevent airborne dust from dispersing into atmosphere and into occupied areas.
- C. If water is used for dust control, provide adequate supply of water. Do not waste water or over saturate construction areas.

3.8 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of 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 Division 01 Section "Closeout Procedures."

END OF SECTION 015000

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 equal products, requests to revise products, and requests for substitutions.
- B. Related Requirements:
 - 1. Division 01 Sections "Warranties" and "Roof Warranties" for additional requirements for warranties.
 - 2. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
 - 3. Divisions 02 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. General: Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents or to negate the meaning of other terms including "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction", and similar terms, which are self-explanatory and have recognized meanings in the construction industry.
 - 1. Definitions used in this Article are intended to support or supplement words or phrases defined in the General Conditions of the Contract.
- B. 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 are current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been installed or in service. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved by Architect 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 named products.
 - 4. Equal Product: Product that is demonstrated to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that satisfy all of the specified requirements of a single product specified with an "or approved equal" clause. Acceptance of Equal Product is subject to approval of Architect, Engineer, or Owner.

5. Substitutions: Products that deviate from the named product or system in at least one significant characteristic. Substitutions must satisfy the general design intent, but may require additional changes or coordination to enable incorporation into the Work. Acceptance of Substitution is subject to approval of Architect, Engineer, or Owner.
- C. Materials: Products that must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, installed or applied to form units of work.
- D. Equipment: Products with operational parts, regardless of whether motorized or manually operated, including products with service connections (wiring, piping, etc.).
- E. Systems: A grouping of materials, parts and/or products that work in conjunction with each other to perform a task or otherwise fulfill a building requirement or function.
- F. Substitutions Requests:
 1. A Substitution Request is a pre-bid request by the Contractor to utilize a different product from that as specified. Post-bid requests are limited to a Substitution Product that can be clearly demonstrated as an added benefit to the Owner.
 2. The requirements for Substitutions do not apply to specified Contractor options on named products and construction methods.
 3. Revisions to Contract Documents, where requested by Architect on behalf of Owner or Engineer, are "Changes in the Work," not Substitutions.
 4. Requested Substitutions approved during bidding period or resulting from negotiations which have been accepted prior to Contract Date, are included as part of the Contract Documents.
 5. Contractor's determination of and compliance with governing regulations and orders issued by governing authorities do not constitute Substitutions; and do not constitute a basis for a Change In the Work, except as provided for in Contract Documents. Otherwise, Contractor's requests for changes in products, materials and methods of construction required by the Contract Documents are considered Substitution Requests, and are subject to the requirements for Substitution Requests.
- G. Equal Product (Alternate Material) Requests: An Equal Product Request is a pre- or post-bid request by the Contractor to utilize a product that the Contractor determines satisfies all of the specified requirements of a single product specified with an "or approved equal" clause. The proposed Equal Product shall satisfy all of the requirements set forth in the specifications and require no modifications to the design.
- H. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "Basis-of-Design," 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 Equal Products. Published attributes and characteristics of basis-of-design product establish salient characteristics of products. Specifying products by a Basis-of-Design does not limit the contractor to providing only that specified product.
- I. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.4 ACTION SUBMITTALS

- A. Pre-Bid Substitution Requests: A pre-bid Substitution Request must be submitted on the provided Substitution Request form, attached at the end of this Section, a minimum of ten (10) calendar days prior to the bid opening. Contractor shall submit the fully completed Substitution Request Form, and all of its required documentation, for consideration of each Substitution Product.

- B. Post-Bid Substitution Requests: A post-bid Substitution Request must be submitted on the provided Substitution Request form, attached at the end of this Section, as soon as possible after bids are received. Contractor shall submit the fully completed Substitution Request Form, and all of its required documentation, for consideration of each Substitution Product.

- C. Substitution Request Form (pre- or post-bid):
 - 1. Utilize form attached at the end of this Section. Complete in full, including all required documentation, prior to submittal to Architect.

 - 2. Fully identify product, equipment, system, fabrication or installation proposed to be replaced by Substitution, including related specification section and drawing number(s), and fully document to show compliance with requirements for Substitutions. Include product data/drawings, description of methods, samples where applicable, Contractor's detailed comparison of significant qualities between specified item and proposed Substitution, statement of effect on construction time and coordination with other affected work, cost information or proposal, and Contractor's statement to the effect that proposed Substitution will result in overall work equal-to-or-better-than work originally indicated.

 - 3. Information that is incomplete will not be considered.

 - 4. Architect's Action:
 - a. Pre-Bid Request: If Substitution Request is approved by Architect or Engineer, approval will be notified by Bid Addendum to all interested bidders. If additional information or documentation is required by Architect after receipt of original Substitution Request, Architect will notify Contractor within three calendar days of request with the need for additional information. However, Substitution Requests, including additional information notifications and receipt, can only be received up to ten calendar days prior to bid opening to allow Architect time to review and incorporate an approvals into a Bid Addendum. If submitted within ten (10) calendar days prior to the Bid Date, Contractor's request for substitution will be received and considered when extensive revisions to Contract Documents are not required and changes are in keeping with general intent of Contract Documents; when timely, fully documented and properly submitted; and when the following conditions is satisfied, all as judged by Architect. Otherwise, requests will be returned without action except to record non-compliance with these requirements.
 - 1) Where substantial advantage is offered Owner, in terms of cost, time or other valuable considerations, after deducting offsetting responsibilities Owner may be required to bear, including additional compensation to Architect/Engineer for redesign and evaluation services, increased cost of other work by Owner or separate contractors, and similar considerations.

 - b. Post-Bid Request: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a Substitution Request. Architect will notify Contractor of approval or rejection of proposed Substitution within 15 calendar days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later. Contractor's request for product revision will be received and considered when extensive revisions to Contract Documents are not required and changes are in keeping with general intent of Contract Documents; when timely, fully documented and properly submitted; and when the following conditions are satisfied, all as

judged by Architect. Otherwise, requests will be returned without action except to record non-compliance with these requirements.

- 1) Where substantial advantage is offered Owner, in terms of cost, time or other valuable considerations, after deducting offsetting responsibilities Owner may be required to bear, including additional compensation to Architect/Engineer for redesign and evaluation services, increased cost of other work by Owner or separate contractors, and similar considerations.
- 2) A Substitution Request will not be received or considered when the request is made by the Contractor in order to procure a product that has a shorter lead time than the specified product, and the Contractor has failed to order the specified product in a timely manner.

D. Equal Product Requests: An Equal Product Request must be submitted on the provided Equal Product Request form, attached at the end of this Section, as soon as possible after bids are received. Contractor shall submit the fully completed Equal Product Request Form, and all of its required documentation, for consideration of each Equal Product.

E. Equal Product Request Form:

1. Utilize form attached at the end of this Section. Complete in full, including all required documentation, prior to submittal to Architect.
2. Information that is incomplete will not be considered.
3. Architect's Action:
 - a. If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of an Equal Product Request. Architect will notify Contractor of approval or rejection of proposed Equal Product within 15 calendar days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - b. Architect will consider Contractor's Equal Product Request when 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.
 - 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.
 - 6) Will coordinate installation and make changes to other work, which may be required for the Work to be complete with no additional cost to Owner.
 - 7) Waives claims for additional costs or time extension, which may subsequently become apparent.

1.5 QUALITY ASSURANCE

- A. Source Limitations: To the greatest extent possible, provide products, materials and equipment of singular generic kind and from a single source.
- B. 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. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
 - 3. Compatibility is a basic general requirement of product/material selections.
- C. Identification of Products: Except as otherwise indicated for required approval labels and operating data, do not permanently attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required labels and stamps on a concealed surface, or, where required for observation following installation, on an accessible surface which, in occupied spaces, is not conspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Indicate manufacturer, product name, model number, serial number, capacity, speed, ratings and similar essential operating data. Locate nameplates on an easily accessed surface which, in occupied spaces, is not conspicuous. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
 - 3. See individual identification sections in Divisions 21, 22, 23, and 26 for additional identification requirements.

1.6 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.7 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. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

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. The compliance requirements, for individual products as indicated in Contract Documents, are multiple in nature and may include generic, descriptive, proprietary, performance, prescriptive, compliance with standards, compliance with codes, conformance with graphic details and other similar forms and methods of indicating requirements, all of which must be complied with. Also "allowances" and similar provisions of Contract Documents will have a bearing on selection process.
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 previously and successfully on other projects and in similar applications.
 3. Continued Availability: Where additional amounts of the product, by nature of its application, are likely to be needed by Owner at a later date for maintenance and repair or replacement work, provide a standard, domestically produced product which is likely to be available to Owner at such later date.
 4. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 5. Where products are accompanied by the term "as selected," Architect will make selection.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

7. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," or "or comparable", comply with requirements in "Equal Products Request" Article to obtain approval for use of an unnamed product.

B. Contractor's options for selecting products are limited by Contract Document requirements, and governing regulations, and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects. Required procedures include, but are not necessarily limited to, the following for various indicated methods of specifying.

1. Limited List of Products: 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 be considered, unless otherwise indicated.

a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

2. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.

a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."

b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

3. Limited List of Manufacturers: 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 be considered, unless otherwise indicated.

a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

4. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."

b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

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 may additionally 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.

6. Visual Matching: Where matching of an established sample is required, final judgement of whether a product proposed by Contractor matches sample satisfactorily is Architect's judgement. Where no product which matches sample satisfactorily and complies with requirements within specified cost category is available, comply with Contract Document provisions concerning Substitutions or Changes in the Work for selection of a matching product outside established cost category or not complying with requirements.
7. 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.
8. Substitution Product: Comply with requirements for Substitution Request in Part 1.
9. Equal Product: Comply with requirements for Equal Product Request in Part 1.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SUBSTITUTION REQUEST

Project: TOC South Cary Water Reclamation Facility – Maintenance Facility with Solar	Request No. (Assigned by DKA)
Owner ID No.: XXXX DKA Project No.: 2403 General Contractor: Submitted By: Date:	

Product Name/Item as listed in specification:	Specification section and paragraph:
Description of Substitution Product:	
Name, Model Number, other information as required to enumerate product	
Proposed cost impact: Y or N	Describe affect, if any on construction schedule:
Supporting Data:	
List attached supporting data including drawings, cut sheets, samples, installation information, etc.	
Affected trades:	
List other trades that are affected by incorporation of this Substitution Product	

The Undersigned certifies that the proposed Substitution:

1. Has been fully investigated and determined to provide evidential benefit to the Owner over the specified product.
2. Will have the same or better warranty coverage and duration.
3. Will have the same or better maintenance and service requirements and availability of replacement parts.
4. Will have no adverse effect on other trades, and will not negatively affect or delay progress schedule.
5. Will not diminish the effectiveness of any rated assembly or in any way affect any quality or function as it relates to Code compliance.
6. Does not alter the design intent and/or functional requirements.
7. Does not require extensive modifications to the design or require extensive coordination.

The Undersigned certifies that the proposed Substitution satisfies all of the requirements set forth in the Contract Documents and in this request.

Requesting Entity:

Submitter Representative Name:	Company:
Signature:	Telephone:

Attachments:

Architect's or Engineer's Action:

- Substitution approved as submitted.
- Substitution approved as noted.
- Substitution rejected.
- Substitution Request not submitted with sufficient documentation to process. Contractor may choose to resubmit with fully required documentation.
- Pre-Bid Substitution Request not submitted in proper timeframe – Action on request not permitted.

Notes:

Designer Representative:	Date:
Signature:	

EQUAL PRODUCT REQUEST

Project: TOC South Cary Water Reclamation Facility - Maintenance Facility with Solar	Request No. (Assigned by DKA)
Owner ID No.: XXXX DKA Project No.: 2403 General Contractor: Submitted By: Date:	

Product Name/Item as listed in specification:	Specification section and paragraph:
Description of Equal Product:	
Name, Model Number, other information as required to enumerate product	
Proposed cost impact: Y or N	Describe affect, if any on construction schedule:
Supporting Data:	
List attached supporting data including drawings, cut sheets, samples, installation information, etc.	
Affected trades:	
List other trades that are affected by incorporation of this Equal Product	

The Undersigned certifies that the proposed Equal Product:

1. Has been fully investigated and determined to be equal or superior to the named product. This includes, but is not limited to, durability, appearance and performance.
2. Will have the same or better warranty coverage and duration.
3. Will have the same or better maintenance and service requirements and availability of replacement parts.
4. Will have no adverse effect on other trades, and will not negatively affect or delay progress schedule.
5. Will not diminish the effectiveness of any rated assembly or in any way affect any quality or function as it relates to Code compliance.
6. Does not alter the design intent and/or functional requirements.

7. Does not require revisions to the Contract Documents or require extensive coordination.

The Undersigned certifies that the proposed Equal Product satisfies all of the requirements set forth in the Contract Documents and in this request.

Requesting Entity:

Submitter Representative Name:	Company:
Signature:	Telephone:

Attachments:

Architect's or Engineer's Action:

- Equal Product approved as submitted.
- Equal Product approved as noted.
- Equal Product rejected.
- Equal Product Request not submitted with sufficient documentation to process. Contractor may choose to resubmit with fully required documentation.

Notes:

Designer Representative:	Date:
Signature:	

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. 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. Coordination of Owner's portion of the Work.
5. Progress cleaning.
6. Starting and adjusting.
7. Demonstration and instruction of Owner Personnel.
8. Protection of installed construction.
9. Correction of the Work.
10. Conservation and salvage.

- B. Related Requirements:

1. Division 01 Section "Summary" for coordination of Owner's separate contracts, and limits on use of Project site.
2. Division 01 Section "Closeout Procedures" for submitting As-Built Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
3. Division 01 Section "Construction Waste Management and Disposal" for salvaging, recycling and disposal of demolition and construction waste.

1.3 PREINSTALLATION MEETINGS

- A. Layout Conference: Conduct conference at Project site.

1. Prior to establishing layout of new perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:

- a. Contractor's superintendent.
- b. Contractor's personnel responsible for performing Project surveying and layout.
- c. Professional engineer responsible for performing site survey serving as basis for Project design.

2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
3. Review requirements for including layouts on Shop Drawings and other submittals.

4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Final Property Survey: Submit three copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS NOT APPLICABLE

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work. Document location of underground utilities and systems.
 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. 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. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with finishes or primers.

- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. 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 local utility and 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 Contractor, submit a Request for Information (RFI) to Architect according to requirements in Division 01 Section "Project Management and Coordination."

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 and existing conditions. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations. Lines and levels for building, walls, and hardscape to comply with applicable tolerances listed in individual Sections.
- E. 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 duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 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 in occupied and 90 inches unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated, to whatever extent these are more explicit or more stringent than applicable requirements indicated in Contract Documents.
1. Inspect each item of materials or equipment immediately prior to installation, and reject damaged and defective items.
 2. Provide attachment and connection devices and methods for securing work properly as it is installed; true to line and level, and within recognized industry tolerances if not otherwise indicated. Allow for expansions and building movements. Provide uniform joint widths in exposed work, organized for best possible visual effect. Refer questionable visual-effect choices to Architect for final decision.
 3. Recheck measurements and dimensions of the work, as an integral step of starting each installation.
 4. Install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure best possible results for each unit of work, in coordination with entire work. Isolate each unit of work from non-compatible work, as required to prevent deterioration.
 5. Coordinate enclosure (closing-in) of work with required inspections and tests, so as to avoid necessity of uncovering work for that purpose.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. 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 of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain, and distribute to the parties involved, templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. 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 with manufacturer.

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.
- I. 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.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 COORDINATION OF OWNER'S PORTION OF THE WORK

- A. Site Access: Provide access to Project site for Owner's separate contractors.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's separate contractors.
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 separate contractors 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. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- 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: 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: To the extent possible through reasonable control and protection methods (including barricade provisions), supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Such exposures include (where applicable, but not by way of limitation) static loading, dynamic loading, internal pressures, external pressures, high or low temperature, thermal shock, high or low humidity, air contamination or pollution, water, ice, solvents, chemicals, light, radiation, puncture, abrasion, heavy traffic, soiling, bacteria, insect infestation, combustion, electrical current, high speed operation, improper lubrication, unusual wear, misuse, incompatible interface, destructive testing, misalignment, excessive weathering, unprotected storage, improper shipping/handling, theft and vandalism.
- 3.8 STARTING AND ADJUSTING
- A. Coordinate schedule for start-up of various equipment and systems.
 - B. Notify Architect and Owner at least three days prior to start-up of each item.
 - C. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
 - D. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
 - E. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - F. Verify that each piece of equipment or system has been checked for proper control sequence, and for conditions which may cause damage.

- G. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- H. Verify that wiring and support components for equipment are complete and tested.
- I. Execute start-up under supervision of applicable Contractor personnel in accordance with manufacturers' instructions.
- J. When specified in individual Sections, require manufacturer to provide authorized representation to be present at site to inspect, check, and approve equipment or system installation prior to start-up and to supervise placing equipment or system in operation.
- K. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 DEMONSTRATION AND INSTRUCTION

- A. As required by individual Sections, demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other seasons within six months.
- C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.
- D. Utilize Operation and Maintenance Manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- E. Prepare and insert additional data in Operations and Maintenance Manuals when need for additional data becomes apparent during instruction.

3.10 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 manufacturers' written instructions for temperature and relative humidity.

3.11 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
 - 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 cannot be satisfactorily repaired or restored or 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.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
 - C. Restore permanent facilities used during construction to their specified condition.
 - D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
 - E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

3.12 CONSERVATION AND SALVAGE

- A. General: It is a general procedural requirement for supervision and administration of the work that construction operations be carried out with maximum practical consideration for conservation of energy, water and materials; and with maximum practical consideration for salvaging materials and equipment involved in performance of the Work but not incorporated therein. Refer to individual Sections for required disposition of salvage materials and equipment that are Owner's property.

END OF SECTION 017300

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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 other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Division 01 Section "Execution" for conservation and salvage.
 - 2. Division 01 Section "Sustainability Requirements" for additional requirements.
 - 3. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

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, structure, and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal of demolition and construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. The Contractor shall submit procedures in the Waste Management Plan indicating the handling, storage and delivery for recycling and re-use options for these materials including the final organization, company or location receiving these products. Facilitate recycling and salvage of materials, including the following:

1. Construction Waste:

- a. Site Clearing Waste.
- b. Masonry and CMU.
- c. Lumber.
- d. Wood sheet materials.
- e. Metals.
- f. Roofing.
- g. Insulation.
- h. Carpet and pad.
- i. Gypsum board.
- j. Piping.
- k. Electrical conduit.
- l. Packaging: Salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Wood pallets.
 - 8) Plastic pails.
- m. Construction Office Waste: Salvage or recycle 100 percent of the following construction office waste materials:
 - 1) Paper.
 - 2) Aluminum cans.
 - 3) Plastic bottles.
 - 4) Glass containers.

1.6 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed.

1.7 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Failure to submit this information by any of the sub-contractors shall render the Contractor's Application for Payment incomplete and shall delay Progress Payment. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.

5. Quantity of waste recycled, both estimated and actual in tons.
 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. 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.
- G. Qualification Data: For Waste Management Coordinator.
- H. Final Waste Management Report: Submit report with final Application for Payment. Report to include waste quantities and fees for the Work as follows.
1. Quantity in tons of waste delivered to landfill.
 2. Quantity in tons of materials diverted from landfill (recycled, salvaged, or reused).
 3. Total of landfill fees.
 4. Total of fees for recycling, salvaging and reusing materials.

1.8 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may serve as Waste Management Coordinator.
- B. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 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.

1.9 WASTE MANAGEMENT PLAN

- A. General: Develop a Waste Management Plan according to ASTM E 1609 and requirements in this Section.
 - 1. Plan shall consist of:
 - a. Waste identification, waste reduction work plan, and cost/revenue analysis.
 - b. On-site sorting location and container labels (if sorted on site).
 - c. Waste hauler name.
 - d. Recycling and adaptive reuse processing facilities and waste type each facility will accept.
 - 2. Distinguish between demolition and construction waste.
 - 3. Indicate quantities by weight or volume, but use same units of measure throughout Waste Management Plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no Waste Management Plan and net additional cost or net savings resulting from implementing Waste Management Plan. Include the following:
 - 1. Total quantity of waste.
 - 2. Estimated cost of disposal (cost per unit). Include transportation and tipping fees and cost of collection containers for each type of waste.
 - 3. Total cost of disposal (with no waste management).
 - 4. Revenue from salvaged materials.
 - 5. Revenue from recycled materials.

6. Savings in transportation and tipping fees by donating materials.
7. Savings in transportation and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS

(NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved Waste Management Plan. 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 operation, termination, and removal requirements in Division 01 Section "Temporary Facilities and Controls."
- A. Waste Management Coordinator: Engage a Waste Management Coordinator to be responsible for implementing, monitoring, and reporting status of Waste Management Plan.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 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.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold. The Contractor shall provide bins, boxes, or other containers for materials holding and recycling as are appropriate for the materials being stored. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
 2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING 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. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved Waste Management Plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials, if found.
 - 2. As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 3. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 4. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 5. Store components off the ground and protect from the weather.
 - 6. Remove recyclable waste from 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 to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
 - 4. Minimize the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground by adhering to the following procedures:
 - a. Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
 - b. Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - c. Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - d. Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - e. Empty paint cans are to be dry prior to disposal or recycling (where available).
 - f. Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

- B. Burning: Do not burn waste materials.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

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SECTION 017700 - CLOSEOUT 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. This 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. Operations and Maintenance Manuals.
 - 5. As-Built Drawings and Documentation.
 - 6. Repair of the Work.
 - 7. Final cleaning.
- B. The Contractor may commence closeout activities at any time during the performance of the Work. Performance of closeout procedures and completion of project closeout have the same schedule requirements as performance of other parts of the Work.
- C. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
 - 2. Divisions 01 Section "Execution" for progress cleaning of Project site.
 - 3. Divisions 01 Sections "Warranties" and "Roof Warranties" for warranty requirements.
 - 4. Divisions 02 through 33 Sections for specific closeout, demonstration and training, and special cleaning requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.
- B. Certificates of Release: Release(s) 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.

1.4 INFORMATIONAL SUBMITTALS

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

1.5 CLOSEOUT SUBMITTALS

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

1.6 MAINTENANCE MATERIAL SUBMITTALS

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

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. Substantial Completion is the date that the Owner, Designer, and Authority having Jurisdiction determine the project is complete enough for the Owner to achieve beneficial occupancy. It is also the date that begins the warranty periods. The inspection for determining the date of Substantial Completion shall be held with the Owner, Designer, and all Contractors and Subcontractors after all systems are in place and in operation. All contractors shall demonstrate to the Designer and Owner that all systems in the building are properly installed, balanced, and performing as designed and specified. All Contractors and Subcontractors shall attend this inspection including the HVAC air and water balance subcontractor. The Designer will generate a final punch list subsequent to this inspection and distribute to the owner and all applicable contractors and subcontractors.
- 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.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 - 6. Advise Owner of changeover in utility services.
 - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 9. Complete final cleaning requirements.
 - 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Submittals at time of inspection for determining date of Substantial Completion:
 - 1. 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.

- 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 Owner's signature for receipt of submittals.
 2. Submit testing, adjusting, and balancing records.
 3. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- E. 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 inspection and tests. On receipt of request, Architect 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. 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. Certificates of Release: 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, 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. 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.
 5. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 6. Submit pest-control final inspection report.
- 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.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS (“CONTRACTOR’S PUNCH LIST”)

- A. Organization of List: Submit the list electronically as a PDF. 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, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems. Include an estimated cost value for each item.
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. Contractor list will include all incomplete and/or non-compliant work. Designers will review Contractor's list prior to scheduling inspection for determining date of Substantial Completion.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. **Submittal Time:** 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. **Special Warranties:** When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier, or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to the final execution.
- C. Refer to Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.
- D. **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.
- E. **Form of submittal:** At Substantial Completion, compile two copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer.
- F. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- A. **Warranty Electronic File:** Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 1. Submit on USB drive.
- B. **Warranties in Paper Form:**
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch 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 names, model numbers, product numbers and designations, serial numbers and colors as applicable, and the name, address and phone of the supplier, manufacturer and installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in Operation and Maintenance Manuals.

1.11 OPERATIONS AND MAINTENANCE MANUALS

A. Operation and Maintenance Manuals: The contractors shall deliver one (1) complete set of tabbed 3-ring binder manuals and three (3) electronic manuals in bookmarked PDF format of all Operation and Maintenance Manuals to the Owner through the Designer, two (2) weeks before the date of Final Completion. The manuals shall be tabbed/bookmarked to a minimum of one level – ie: each major piece of equipment (finishes product, chiller, boiler, switchboard, water heater, etc.) or document category (warranties, parts list, contact information, maintenance information, etc.) The manuals shall be delivered by one of the following:

1. USB Drive
2. CD/DVD
3. Downloadable file from FTP Site.

B. Manuals shall include the following (at a minimum):

1. Index and tabs/bookmarks.
2. Certificate of Substantial Completion.
3. Summary sheet of warranties with dates noted and a copy of all warranties.
4. List of all subcontractors and suppliers with names, addresses, and phone numbers.
5. Special Inspection Reports.
6. Certified Test and Balance Report.
7. Complete start-up, operation, and shutdown procedures for each system including sequence of events, locations of switches, emergency procedures, and any other critical items.
8. Lubrication schedules and types of lubricants.
9. Equipment summary showing all capacities and ratings (HP, Tons, kW, filter size, etc.)
10. Complete set of all approved submittals and shop drawings in electronic PDF format only; no printed copies are required.

C. Include the following minimum information as applicable to the products or equipment.

1. Emergency instructions including contact information for emergency repair services.
2. Dealer locations and contact information for spare parts.
3. Warranties.
4. Wiring and piping diagrams.
5. Recommended "turn-around" or replacement or refurbishing cycles.
6. Lubrication schedules and materials.
7. Complete start-up, operation, and shutdown procedures for each system including sequence of events, locations of switches, emergency procedures and any other critical items.
8. Inspection procedures.
9. Cleaning procedures including recommended cleaning agents, schedules and procedures.

D. Include operations and maintenance data for all equipment, machines, parts, materials and systems whether specifically required or not for all items that require maintenance, cleaning, servicing, that are electrified or have moving parts or that have a warranty.

1.12 AS-BUILT DRAWINGS & DOCUMENTATION

A. Maintain a white-print set (black-line) of contract drawings and shop drawings in clean, undamaged condition, with mark-up of actual installations which vary substantially from the work as originally shown. The Contractor shall record all changes from the Contract Drawings, including accurate

dimensions where applicable including invert elevations for all below-grade outside utilities with reference to permanent above-grade objects.

1. Do not use the as-built set for any other construction related activities. Do not 'break up' the set into individual drawings or portions.
 2. Mark whichever drawing is most capable of showing "field" condition fully and accurately. Where shop drawings are used for mark-up, record a cross-reference at corresponding location on working drawings. Mark with permanent red ink and, where required for clarity, use other colors to distinguish between variations in separate categories of work. Give particular attention to concealed work, which would be difficult to measure and record at a later date.
 3. Organize as-built drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on cover of each set. Submit to Architect as "As Built Drawings" for Owner's records, so that Architect may prepare a set of reproducible record drawings for Owner's use.
 4. Record and submit any revised specifications resulting from substitutions or Contractor-requested changes.
 5. The 'As-Built' submittal will consist of the following items in the following formats:
 - a. Neatly drafted complete set of "redline" drawings to Designer, scanned and paper copies.
 - b. Neatly annotated complete set of "redline" project specifications to Designer, scanned and paper copies.
- B. Camera and record all waste plumbing lines, 3-inches or larger to first manhole outside building, after construction is complete.
1. Submit one copy of electronic video to Owner with clear documentation of where video footage was taken at each separate waste plumbing line.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Low-emitting Cleaning Agents for use within the Building Interior: Use low-VOC 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.
- B. Other 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 REPAIR OF THE WORK

- A. Complete correction of the Work required by Division 01 Section "Execution" before requesting inspection for determination of Substantial Completion.

3.2 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

- B. Provide additional final cleaning to areas of Work that are affected by Contractor's activities after initial final cleaning. Provide additional final cleaning in specified areas as directed by Architect at inspection for determining date of Substantial Completion.
- C. 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. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - i. Vacuum and mop concrete.
 - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - k. 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.
 - l. Remove labels that are not permanent.
 - m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - r. Clean strainers.
 - s. Leave Project clean and ready for occupancy.
- D. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare written report.
- E. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.
- F. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

- G. Removal of Protection: Except as otherwise indicated or requested by Architect, remove temporary protection devices and facilities which were installed during course of the work to protect previously completed work during remainder of construction period.

END OF SECTION 017700

SECTION 017740 – WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer’s standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor’s period for correction of Work.

1.3 RELATED SECTIONS

- A. Division 01 Section “Closeout Procedures” for procedures related to submitting warranties.
- B. Division 01 Section “Roof Warranties” for warranties specific to roofing systems.
- C. Divisions 02 through 33 Sections for specific requirements for continuing services to the Owner.
- D. Disclaimers and Limitations: Manufacturer’s disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer’s disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.4 DEFINITIONS

- A. Standard product warranties are preprinted written warranties published by the individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.5 WARRANTY REQUIREMENTS

- A. Related damage and losses: When correcting failed or damaged warranted construction, remove and replace Work that has been damaged as a result of such failure, or must be removed and replaced to provide access for correction of warranted construction.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or reworking, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement cost: Upon determination that Work covered by a warranty has failed, replace or rework the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or reworking defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

- D. Owner’s recourse: Expressed warranties made to the Owner are in an addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- F. Where the Contract Documents require a special warranty or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.
- G. All work shall be fully warranted for one year from the date of Substantial Completion by the contractor who shall replace any defective materials and repair any defective workmanship. In addition, written warranties shall be provided as required by Divisions 02 through 33 Sections.

1.6 SUBMITTALS

- A. See Division 01 Section “Closeout Procedures” for warranty submittal requirements.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 017740

SECTION 017750 – ROOF WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. This Section includes administrative and procedural requirements for Roof Warranties.

- B. Related Requirements:

- 1. Division 01 Section “Warranties”.
 - 2. Division 06 Section “Rough Carpentry”.
 - 3. Division 07 Section “Standing-Seam Metal Roof Panel System”
 - 4. Division 07 Section “Thermoplastic Polyolefin (TPO) Roofing”.
 - 5. Division 07 Section “Sheet Metal Flashing and Trim”.
 - 6. Division 07 Section “Joint Sealants”.

1.3 CLOSEOUT SUBMITTALS

- A. Upon completion of the work and prior to the final payment the Contractor shall submit the following items to the Designer. All such documents shall show the project name, Architect’s number, project location and the Owner’s name:

- 1. Written statement on company letterhead indicating completion of all items noted on roof punch lists prepared by the Designer.
 - 2. Copy of Architect’s punchlist with each item checked and initialed by employee who performed inspection.
 - 3. Three original copies of Contractor’s Roofing System Guarantee to Owner for each roofing system type.
 - 4. Three original copies of Roof System Manufacturer’s Guarantee to Owner for each roofing system type.

- B. The effective date of all warranties shall be the same unless the Contract Documents indicate the project is constructed in distinct phases with distinct dates of Substantial Completion AND as approved by the Architect. Warranties shall commence on the date of Substantial Completion as determined by the Architect unless otherwise agreed to in writing by the Architect.

1.4 SPECIAL WARRANTIES

- A. General:

- 1. All guarantees shall be issued to the Owner or party designated by the Designer and shall not require the signature of the Owner.
 - 2. All guarantees shall be issued bearing the signature of an Officer of the Manufacturer or Contractor as applicable.

3. All guarantees shall commence on the date of Substantial Completion as determined by the Architect and shall be in force for the durations as noted below.
 4. All guarantees shall cover damage due to wind up to and including the design wind speed and/or uplift pressures defined in the roofing specifications.
 5. All guarantees shall not include any language excluding coverage for any of the following:
 - a. Failure of the roofing contractor to properly install the roof system or to use properly certified personnel.
 - b. Failure of the roofing contractor to utilize manufacturer approved materials or methods.
 - c. Requirements for the owner to maintain records of material procurement including but not limited to purchase orders, order numbers, manufacturer's invoices or shipment dates.
 - d. Failure of the roofing contractor to correct any deficiencies identified by the manufacturer.
 6. In the event of a claim against the warranty, the manufacturer shall be responsible for all costs related to the investigation of said claim.
- B. Contractor's Guarantee:
1. Duration - Two (2) years from date of Substantial Completion.
 2. The Contractor and the Owner's representative shall conduct an inspection approximately 30 days prior to the end of the Contractor's guarantee to determine the present physical condition of the roofing system. The Owner's representative shall then submit a written report as to the findings of this inspection and the roofing Contractor, at his own expense, shall repair any defects covered under the scope of this Contract
 3. The Contractor's Guarantee shall neither replace nor negate any agreement furnished by the manufacturers.
- C. Standing Seam Metal Roofing System Manufacturers Guarantee (Applies to all areas of Standing Seam Roofing): The Contractor shall provide a manufacturer's 20-year no dollar limit material and workmanship system warranty. The system shall include all components of the Standing Seam Metal Roofing System including, but not limited to sheet metal flashings and fastening systems The Standing Seam Metal Roofing Manufacturer shall agree that the work covered under this contract shall remain free from any water penetration and material defects caused by defective workmanship or materials for a period of twenty (20) **years** from the date of Substantial Completion.
- D. TPO Roof System Manufacturer's Guarantee (Applies to the single story "L" shaped portion of the building) - The Contractor shall provide a manufacturer's 20-year no dollar limit material and workmanship system warranty. The system shall include all new components above the roof deck such as the primer, substrate board, cover board, insulation, fastening system, expansion joints, membrane, and all sheet metal and flashing components and shall include all portions of the fastening components that extend below the top of the roof deck. The Membrane Manufacturer shall agree that the work covered under this contract shall remain free from any water penetration and material defects caused by defective workmanship or materials for a period of twenty (20) years from the date of Substantial Completion. The Contractor's warranty shall neither replace nor negate any agreement furnished by the manufacturer.
- E. Sealant Manufacturer's Warranty – Manufacturer shall agree that all exterior joint sealant used in roofing, and roofing flashing and trim work shall remain free from any physical defects caused by defective workmanship or materials for a period of twenty (20) years from date of Substantial Completion.

- F. Flashing and Trim Sheet Metal Manufacturer’s Finish Warranty – The sheet metal manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows 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: Twenty (20) years from date of Substantial Completion.

1.5 EMERGENCY REPAIRS

- A. Emergency repairs to defects and leaks shall be performed within 24 hours of receiving notice from the Owner. As soon as weather permits, permanent repairs and restoration of affected areas shall be accomplished in a manner in conformance with the original contract requirements. This work shall be done without additional cost to the Owner, except if it is determined that such leaks and defects were caused by abuse, lightning, winds in excess of stated values in the product specifications or hail.
- B. The warranties shall also state that the Owner has the right, at any time during the Contractor's warranty period and the Manufacturer's warranty period, to make emergency repairs to protect the contents of the building or the building itself from damage due to leaking. The cost of emergency repairs made during the first two years of the warranty period shall be borne by the Contractor and action by the Owner shall not invalidate the warranty.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 017750

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 DEFINITIONS

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

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Aggregates.
5. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
6. Vapor retarders.
7. Curing materials.
8. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.

C. Shop Drawings:

1. Steel Reinforcement Shop Drawings: Indicate and detail fabrication, bending and placement of steel reinforcement. Include bar sizes, lengths, bar schedules, bent bar diagrams, bar arrangement, splices and laps, and supports for concrete reinforcement.
 - a. Include applicable dimensions, sections, elevations, and details required to complete installation and coordination of the details and typical details. Plan shall be drawn at a scale of no less than 1/8" per foot.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Floor and slab treatments.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Repair materials.

C. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

- C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
 - 1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.
- B. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.7 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
 - 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 3. Do not use frozen materials or materials containing ice or snow.
 - 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
 - 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
 - 1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.
 - 4. Furnish plastic or galvanized ties for concrete permanently exposed to weather.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.

2.5 FABRICATING REINFORCEMENT

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

2.6 CONCRETE MATERIALS

- A. Source Limitations:
 - 1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
 - 2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
 - 3. Obtain aggregate from single source.
 - 4. Obtain each type of admixture from single source from single manufacturer.
- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C150/C150M, Type I/II, gray.
 - 2. Fly Ash: ASTM C618, Class C or F.

- C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Alkali-Silica Reaction: Comply with one of the following:
 - a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
 - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
 - c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
 - 2. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 - 3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C260/C260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.7 VAPOR RETARDERS

- A. Underslab Vapor Barrier: Product complying with ASTM E 1745, Class A.
 - 1. Maximum Permeance ASTM E96: 0.01 perms (English).
 - 2. Provide standard accessories and tape for complete system.
 - 3. Acceptable Products:
 - a. Basis-of-Design: Stego Wrap (15-mil) Vapor Barrier by STEGO INDUSTRIES LLC.
 - b. Perminator 15 mils by W.R. Meadows, Inc.
 - c. Moistop Ultra 15 by Fortifiber.
 - 4. Single ply polyethylene is prohibited.
 - 5. Basis-of-Design Accessories:
 - a. Seams:
 - 1) Stego Tape by Stego Industries LLC, www.stegoindustries.com.
 - b. Penetrations of Vapor barrier:
 - 1) Stego Mastic by Stego Industries LLC, www.stegoindustries.com.
 - 2) Stego Tape by Stego Industries LLC, www.stegoindustries.com.
 - c. Perimeter/edge seal:
 - 1) Stego Crete Claw by Stego Industries LLC, www.stegoindustries.com .
 - 2) Stego Term Bar by Stego Industries LLC, www.stegoindustries.com.
 - 3) StegoTack Tape (double sided) by Stego Industries LLC, www.stegoindustries.com.

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. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
 - 1. Color:
 - a. Ambient Temperature Below 50 deg F: Black.
 - b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
 - c. Ambient Temperature Above 85 deg F: White.
- D. Curing Paper: 8-feet-wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
- E. Water: Potable or complying with ASTM C1602/C1602M.
- F. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:
 - 1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.10 REPAIR MATERIALS

- A. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 - 2. Primer: Product of topping 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 topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
 - 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.

2.12 CONCRETE MIXTURES

- A. Class A: Normal-weight concrete used for footings.
 - 1. Minimum Compressive Strength: 3000 psi at 28 days.
 - 2. Slump Limit: 4 inches, plus or minus 1 inch or 8 inches maximum for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
 - 3. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- B. Class B: Normal-weight concrete used for interior slabs-on-ground.
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Minimum Cementitious Materials Content: 470 lb/cu. yd.
 - 3. Slump Limit: 4 inches, plus or minus 1 inch or 8 inches maximum for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
 - 4. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
 - 5. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- C. Class C: Structural lightweight concrete used for interior suspended slabs.
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.

2. Calculated Equilibrium Unit Weight: 115 lb/cu. ft., plus or minus 3 lb/cu. ft. as determined by ASTM C567/C567M.
3. Slump Limit: 4 inches, plus or minus 1 inch or 8 inches maximum for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
4. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
5. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

2.13 FABRICATING REINFORCEMENT

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

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
 1. Daily access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 ([ACI 301M](#)), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

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

3.4 INSTALLATION OF 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.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
 - 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.5 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 48 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.6 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
 - 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 - 2. Face laps away from exposed direction of concrete pour.
 - 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
 - 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
 - 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 - 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 - 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.7 VAPOR-BARRIER INSTALLATION

- A. Sheet Vapor Barrier: Place, protect, and repair sheet vapor barrier according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.8 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.9 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 - 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 - 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.10 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
 - 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 - 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 - 1. If a section cannot be placed continuously, provide construction joints as indicated.
 - 2. Deposit concrete to avoid segregation.
 - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- F. 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. Do not place concrete floors and slabs in a checkerboard sequence.
 - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 3. Maintain reinforcement in position on chairs during concrete placement.
 - 4. Screenshot slab surfaces with a straightedge and strike off to correct elevations.
 - 5. Level concrete, cut high areas, and fill low areas.
 - 6. Slope surfaces uniformly to drains where required.
 - 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 - 8. Do not further disturb slab surfaces before starting finishing operations.

3.11 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
 - b. Remove projections larger than 1 inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 Class D.
 - e. Apply to concrete surfaces not exposed to public view.
2. ACI 301 Surface Finish SF-3.0:
 - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - b. Remove projections larger than 1/8 inch.
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 Class A.
 - e. Locations: Apply to concrete surfaces exposed to public view.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.12 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to 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.

7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
 - a. Slabs on Ground:
 - 1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
 - b. Suspended Slabs:
 - 1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
 2. Coordinate required final finish with Architect before application.

3.13 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling In:
 1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
 3. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 6 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 3500 psi at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
 1. Cast-in inserts and accessories, as shown on Drawings.
 2. Screed, tamp, and trowel finish concrete surfaces.

3.14 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 - 1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
 - 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
 - 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and during finishing operations.

- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
 - 1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 - 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 - 3. If forms remain during curing period, moist cure after loosening forms.
 - 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.

- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
 - 1. Begin curing immediately after finishing concrete.
 - 2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

- a) Water.
- b) Continuous water-fog spray.

b. Floors to Receive Curing Compound:

- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Maintain continuity of coating, and repair damage during curing period.
- 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

3.15 TOLERANCES

A. Conform to ACI 117.

3.16 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

- 1. Repair and patch defective areas when approved by Architect.
- 2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

- 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
 - a. Limit cut depth to 3/4 inch.
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.
 - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
- 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
 - a. Correct low and high areas.
 - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including 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.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
 - a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
 - a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.
 - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
 - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
 - a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
 - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
 - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
 - d. Place, compact, and finish to blend with adjacent finished concrete.
 - e. Cure in same manner as adjacent concrete.
8. Repair random cracks $> 1/16"$, and single holes 1 inch or less in diameter with patching mortar.
 - a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
 - b. Dampen cleaned concrete surfaces and apply bonding agent.
 - c. Place patching mortar before bonding agent has dried.
 - d. Compact patching mortar and finish to match adjacent concrete.
 - e. Keep patched area continuously moist for at least 72 hours.

- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.17 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

- 1. Special Inspector to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
- 2. Special Inspector to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
- 3. Special Inspector to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

- a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

- 1) Project name.
- 2) Name of testing agency.
- 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
- 4) Name of concrete manufacturer.
- 5) Date and time of inspection, sampling, and field testing.
- 6) Date and time of concrete placement.
- 7) Location in Work of concrete represented by samples.
- 8) Date and time sample was obtained.
- 9) Truck and batch ticket numbers.
- 10) Design compressive strength at 28 days.
- 11) Concrete mixture designation, proportions, and materials.
- 12) Field test results.
- 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
- 14) Type of fracture and compressive break strengths at seven days and 28 days.

- B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

- C. Inspections:

- 1. Headed bolts and studs.
- 2. Verification of use of required design mixture.
- 3. Concrete placement, including conveying and depositing.
- 4. Curing procedures and maintenance of curing temperature.
- 5. Verification of concrete strength before removal of shores and forms from beams and slabs.

- D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:

- 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture 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 provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure two sets of [two] [three] [four] 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
 - b. Cast, initial cure, and field cure [two] <Insert number> sets of [two] [three] [four] standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of two laboratory-cured specimens at seven days and one set of three specimens at 28 days.
 - b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
10. 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.
11. Additional Tests:
 - a. Testing and inspecting agency to 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.

- b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.
- 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.18 PROTECTION

- A. Protect concrete surfaces as follows:
 - 1. Protect from petroleum stains.
 - 2. Diaper hydraulic equipment used over concrete surfaces.
 - 3. Prohibit vehicles from interior concrete slabs.
 - 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
 - 5. Prohibit placement of steel items on concrete surfaces.
 - 6. Prohibit use of acids or acidic detergents over concrete surfaces.
 - 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
 - 8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The extent of each type of unit masonry work is shown on drawings and schedules and specified herein. This section includes but is not necessarily limited to the following:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Masonry joint reinforcement.
 - 4. Ties and anchors.
 - 5. Embedded flashing.
 - 6. Miscellaneous masonry accessories.
- B. Related Sections include the following:
 - 1. Division 07 Section "Bituminous Dampproofing."
 - 2. Division 07 Section "Building Insulation" for rigid insulation installed in cavity walls.
 - 3. Division 07 Section "Fluid-Applied Membrane Air Barriers."
 - 4. Division 07 Section "Joint Sealants."
 - 5. Division 07 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.

1.3 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
- B. Samples for Verification: For each type and color of the following:
 - 1. Exposed CMUs.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
 - 1. Each type of masonry unit required.
 - 2. Mortar complying with property requirements of ASTM C 270.
 - 3. Grout mixes complying with proportions mix design of ASTM C 476. Include description of type and volumetric proportions of grout ingredients.

1.4 QUALITY ASSURANCE

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

1.5 REFERENCES

- A. ASTM C33- Specification for Concrete Aggregates.
- B. ASTM C150- Specification for Portland Cement.
- C. PCI- Manual for Quality Control for Precast and Prestressed Concrete MNL-116.
- D. ACI- Building Code Requirements for Structural Concrete, ACI-318 and ACI- 530.

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.
- A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, 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.
- D. 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 down both sides and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches 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 3 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 coverings spread 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 and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
 1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS (CMUs)

- A. General: Provide shapes indicated and as follows:
 1. Provide bullnose units for outside corners, wall ends and jambs at openings at all new walls (interior to the building), unless otherwise indicated.
 2. Provide special shapes for sills, lintels, corners, jambs, sash, control joints, headers, bonding, pilasters and other special conditions.
 3. Provide standard units for exterior and interior walls of nominal size 8 x 8 x 16 CMU and 4 x 8 x 16 CMU as indicated.
 4. For exterior veneer, provide split face nominal 4 x 8 x 16 CMU in locations as indicated on drawings.
 - a. Color: As selected by Architect from manufacturer's full range.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
 1. Weight Classification: Lightweight, unless otherwise indicated.
 2. Size (Width): Manufactured to actual dimensions 3/8 inch less than specified nominal dimensions.

2.2 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II. Do not use calcium chloride in mortar or grout. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
- D. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve. Provide aggregate color to suit mortar pigment color required.
- E. Aggregate for Grout: ASTM C 404.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.
- H. Water: Potable.

2.3 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A 951 and as follows:

1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
 2. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
 3. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
 4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.
- B. For single-wythe masonry, provide truss type with single pair of side rods and cross rods spaced not more than 16 inches o.c.
- C. For multiwythe masonry, provide types as follows:
1. Ladder type with perpendicular cross rods spaced not more than 16 inches o.c. and 1 side rod for each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod for each wythe of masonry 4 inches or less in width.
 2. Tab type with single pair of side rods spaced for embedment within each face shell of backup wythe and rectangular box-type cross ties spaced not more than 16 inches o.c. Size ties to extend at least halfway through outer wythe but with at least 5/8-inch cover on outside face.

2.4 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- C. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.
- D. Stainless-Steel Sheet: ASTM A 666, Type 304 or 316.

2.5 BENT WIRE TIES

- A. General: Rectangular units with closed ends and not less than 4 inches wide. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.
1. At CMU veneer over CMU backup walls, where wythes are of different materials and where coursing between wythes does not align, use adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches.
 2. Provide ties of sufficient length to accommodate varying veneer installations as indicated.

2.6 MISCELLANEOUS ANCHORS

- A. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
1. Type: Chemical anchors.
 2. Type: Expansion anchors.
 3. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.
 4. For Postinstalled Anchors: Capability to sustain, without failure, a load equal to six times the loads imposed.

2.7 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing, General: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with **Division 07 Section "Sheet Metal Flashing and Trim"** and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.03 inch (0.4 mm) thick.
- B. Through-Wall Flashing: Fabricate through-wall metal flashing embedded in masonry from stainless steel and as follows:
 1. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.6 m), under copings, at shelf angles and where indicated. Provide splice plates at joints of formed, smooth metal flashing.
 2. Fabricate through-wall flashing with sealant stop, unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch (19 mm) at exterior face of wall and down into joint 3/8 inch (10 mm) to form a stop for retaining sealant backer rod.
 3. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.8 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: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
 1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
- C. Cavity Drainage Material: Polyester mesh or nylon trapezoidal cavity drainage system as part of standard masonry cavity wall flashing/weep hole wall drainage systems. Designed to keep weep holes open and flashing free of mortar droppings and debris by catching and permanently suspending droppings above the level of the top of the weep hole vents.
 1. Fabricated in a 90% open mesh, use multiple layers to fill cavity.

2.9 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned. Verify suitability of cleaner with mortar tint used as specified elsewhere.

2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
 2. Limit cementitious materials in mortar to portland cement and lime.
 3. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification.
 1. For masonry below grade, in contact with earth, and where indicated, use Type S.

2. For exterior, above-grade, load-bearing and non-load-bearing walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.
 3. For interior non-load-bearing partitions, Type O or Type N.
- C. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit pigments to the following percentages of cement content by weight:
1. For mineral-oxide pigments and portland cement-lime mortar, not more than 10 percent.
 2. For carbon-black pigment and portland cement-lime mortar, not more than 2 percent.
 3. Mix to match Architect's sample.
 4. Pre-tinted mortar mixes shall be used in lieu of field mixed pigments
- D. Grout for Unit Masonry: Comply with ASTM C 476 Proportions specification. DO NOT substitute mortar for Grout.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
1. Verify that footings and foundations are within tolerances specified.
 2. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction 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 the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, 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 colors and textures.
1. Mix units from several pallets or cubes as they are placed.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 3/8 inch maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.
- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.
- E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/16 inch, with a maximum thickness limited to 1/8 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/16 inch.
- F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/16 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/16 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
 - 1. Running Bond.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow-metal 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 in the joint below and rod grout into core.
- H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. 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, install firestopping in joint between top of partition and underside of structure above to comply with Division 07 Section "Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.

3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- 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.
 1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the CMU veneer.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) and damproofing and air-barrier coating, unless otherwise indicated.

3.6 CAVITY WALLS

- A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.
- B. Coat cavity face of backup wythe to comply with Division 07 Section "Fluid-Applied Membrane Air Barriers."
- C. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards or exterior face of masonry wall, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction. **Insulation to be fixed tight to substrate with adhesive or fasteners.**
 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 MASONRY JOINT REINFORCEMENT

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

3.8 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 1. At structural masonry walls with masonry veneer, anchor veneer with horizontal, ladder type reinforcing as specified.
 2. Embed connector sections and continuous wire in masonry joints.
 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.

4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 1. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete.
- C. Form expansion joints in concrete masonry as follows:
 1. Build in joint fillers where indicated.
 2. Form open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants." Keep joint free and clear of mortar.
- D. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants."
 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.
- E. Masonry walls and veneers to have vertical control joints spaced at not more than 30 feet, unless otherwise indicated. Coordinate joint locations with Architect if locations are not indicated on Drawings.

3.10 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- C. Install flashing as follows except as indicated elsewhere:
 1. At multiwythe masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up a minimum of 4 inches, and through inner wythe to within 1/2 inch of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through inner wythe and turn flashing up approximately 2 inches, unless otherwise indicated.
 2. Extend sheet metal flashing 1/2 inch beyond face of masonry at exterior and turn flashing down to form a drip.
 3. Solder joints of horizontal legs of flashing.
 4. Lap ends of through-wall flashing 4 inches minimum and solder laps completely. Every 20 feet, seal lap joint with three rows of permanent, non-shrinking sealant.
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
 1. Use open head joints to form weep holes. Use open head joints 4 inches high at Concrete Masonry Units.

2. Space weep holes 24 inches o.c.
- E. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.11 FIELD QUALITY CONTROL

- A. Inspectors: Owner will engage qualified independent testing agency 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. Mortar properties will be tested, per ASTM C 780. Provide one test every 500 s.f. of installed masonry.
- C. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019. Provide one test for every 500 s.f. of installed load bearing masonry.

3.12 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

3.13 MASONRY WASTE DISPOSAL

- A. Recycling: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Disposal as Fill Material: Dispose of clean masonry waste, including broken masonry units, waste mortar, and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
 1. Crush masonry waste to less than 4 inches in each dimension.

2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
 3. Do not dispose of masonry waste as fill within 18 inches 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

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SECTION 05 12 00 – STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified fabricator.
- B. Welding certificates.

- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
 - 1. Exception: The fabricator maintains detailed fabrication and quality control procedures which provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved drawings, project specifications and referenced standards.
 - a. At the Contractor's expense, an Independent Testing Agency acceptable to Architect shall review the procedures to the completeness and adequacy relative to the Code requirements for the fabricators scope of work.
 - b. The fabricator shall bear the expense of all special inspections of the fabrication shop if the Independent Testing Agency determines that the quality control procedures are inadequate.
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels,Angles,:ASTM A 36/A 36M
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

2.3 PRIMER

- A. Primer: Comply with Division 09 painting sections.
- B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- C. Galvanizing Repair Paint: ASTM A 780/A 780M.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 2. Mark and match-mark materials for field assembly.
 - 3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

- E. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces.

2.6 SHOP CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

Shop prime steel surfaces except the following:

- 1. Surfaces to be field welded.
 - 2. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 3. Galvanized surfaces.
 - 4. Surfaces enclosed in interior construction.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize all steel exposed to weather in final construction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION 05 12 00

SECTION 05 31 00 - STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Type VLI Composite Floor Deck.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for lightweight structural concrete fill over steel deck.

1.3 SUBMITTALS

- A. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- B. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- B. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 COMPOSITE FLOOR DECK

- A. Fabrication of Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with SDI C, with the minimum section properties indicated, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade G60 zinc coating.
 - 2. Profile Depth: As indicated
 - 3. Design Uncoated-Steel Thickness: As indicated.
 - 4. Span Condition: Triple span or more.
 - 5. Side Laps: Overlapped.

2.2 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- C. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- D. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated.
- E. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- F. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- G. Galvanizing Repair Paint: ASTM A 780.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.

- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 30 10

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Steel framing and supports for countertops.
2. Steel tube reinforcement for low partitions.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Shelf angles.
6. Metal ladders.
7. Metal floor plate and supports.
8. Miscellaneous steel trim including steel angle corner guards steel edgings .
9. Abrasive metal nosings and treads and .

- B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

- C. Related Requirements:

1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
2. Section 051200 "Structural Steel Framing" for steel framing, supports, elevator machine beams, hoist beams, divider beams, door frames, and other steel items attached to the structural-steel framing.
3. Section 077200 "Roof Accessories" for manufactured metal roof walkways and metal roof stairs.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Fasteners.
3. Shop primers.
4. Shrinkage-resisting grout.
5. Prefabricated building columns.
6. Manufactured metal ladders.
7. Abrasive metal nosings treads .
8. Metal downspout boots.

- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for countertops.
2. Steel tube reinforcement for low partitions.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Elevator machine beams , hoist beams, .
6. Steel shapes for supporting elevator door sills.
7. Shelf angles.
8. Metal ladders.
9. Miscellaneous steel trim including steel angle corner guards steel edgings .
10. Loose steel lintels.

- C. Samples for Verification: For each type and finish of extruded nosing and tread.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 304 .
- D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304 .
- E. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
- F. Rolled-Stainless Steel Floor Plate: ASTM A793.
- G. Abrasive-Surface Floor Plate: Steel plate with abrasive material metallurgically bonded to steel.
 - 1. Source Limitations: Obtain floor plate from single source from single manufacturer.
- H. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- I. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- J. Aluminum Plate and Sheet: **ASTM B209**, Alloy 6061-T6.
- K. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.
- L. Nickel Silver Extrusions: ASTM B151/B151M, Alloy UNS No. C74500.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless steel fasteners for fastening stainless steel .
 - 2. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, **ASTM A307, Grade A**; with hex nuts, **ASTM A563**; and, where indicated, flat washers.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, **Grade A325**, Type 3, heavy-hex steel structural bolts; **ASTM A563, Grade DH3**, heavy-hex carbon-steel nuts; and where indicated, flat washers.
- D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, **ASTM F593**; with hex nuts, **ASTM F594**; and, where indicated, flat washers; Alloy Group 1 .
- E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, **ASTM A563**; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: 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 concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

2.4 MISCELLANEOUS MATERIALS

- A. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- D. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32 inch** unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, **1/8 by 1-1/2 inches**, with a minimum **6-inch** embedment and **2-inch** hook, not less than **8 inches** from ends and corners of units and **24 inches** o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Furnish inserts for units installed after concrete is placed.
- C. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
 - 1. Provide bearing plates welded to beams where indicated.
 - 2. Drill or punch girders and plates for field-bolted connections where indicated.
 - 3. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at **24 inches** o.c.
- D. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
 - 1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
 - 2. Unless otherwise indicated, provide **1/2-inch** baseplates with four **5/8-inch** anchor bolts and **1/4-inch** top plates.
- E. Galvanize miscellaneous framing and supports where indicated.
- F. Prime miscellaneous framing and supports with primer specified in Section 099600 "High-Performance Coatings" where indicated.

2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive **3/4-inch** bolts, spaced not more than **6 inches** from ends and **24 inches** o.c., unless otherwise indicated.
 - 1. Provide mitered and welded units at corners.
 - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately **2 inches** larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize and prime shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with zinc-rich primer.
- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General:

1. Comply with ANSI A14.3 , except for elevator pit ladders.
2. For elevator pit ladders, comply with ASME A17.1/CSA B44.

B. Steel Ladders:

1. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
2. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
3. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
4. Source Limitations: Obtain nonslip surfaces from single source from single manufacturer.
5. Support each ladder at top and bottom and not more than **60 inches** o.c. with welded or bolted steel brackets.
6. Prime exterior ladders, including brackets and fasteners, with zinc-rich primer.

2.9 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize and prime exterior miscellaneous steel trim.
- D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.10 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than **8 inches** unless otherwise indicated.
- C. Galvanize and prime loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.11 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.12 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.13 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with unless zinc-rich primer is indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
 - 5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.14 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.

- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for overhead doors securely to, and rigidly brace from, building structure.

- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installation of Bearing and Leveling Plates" Article.
 - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLATION OF PIPE GUARDS

- A. Provide pipe guards at exposed vertical pipes in at locations indicated on Drawings where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four **3/4-inch** bolts at each pipe guard. Mount pipe guards with top edge **26 inches** above driving surface.

3.4 INSTALLATION OF NOSINGS, TREADS, AND THRESHOLDS

- A. Center nosings on tread widths unless otherwise indicated.
- B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.
- C. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 079200 "Joint Sealants" to provide a watertight installation.

3.5 INSTALLATION OF BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 REPAIRS

- A. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum **2.0-mil** dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in
 - B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

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SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Steel railings.

- B. Related Requirements:

- 1. Section 055113 "Metal Pan Stairs" for steel tube railings associated with metal pan stairs.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. 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.

1.4 ACTION SUBMITTALS

- A. Product Data:

- 1. Fasteners.
 - 2. Post-installed anchors.
 - 3. Handrail brackets.
 - 4. Shop primer.
 - 5. Intermediate coats and topcoats.
 - 6. Bituminous paint.
 - 7. Nonshrink, nonmetallic grout.
 - 8. Metal finishes.
 - 9. Paint products.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

- C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For delegated-design professional engineer .
- B. Welding certificates.
- C. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of **50 lbf/ ft.** applied in any direction.
 - b. Concentrated load of **250 lbf** applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:

- a. Concentrated load of **50 lbf** applied horizontally on an area of **1 sq. ft.**.
- b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 1. Provide one piece cast iron hand rail wall mounting brackets. Brackets to be fabricated with 2 3/4 inch diameter round wall plate with holes for exposed fasteners and rounded rail support arm. Bracket to have radius rail seat for welded attachment of rail. Bracket to hold rail center 2 1/2 inches from wall. Acceptable products include but are not limited to model 382 by Julius Blum, Inc.

2.3 STEEL RAILINGS

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Tubing: ASTM A500/A500M (cold formed) .
- C. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 1. Provide galvanized finish for exterior installations and where indicated.

2.4 FASTENERS

- A. Fastener Materials:
 1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with **ASTM F1941**, Class Fe/Zn 5 for zinc coating.
 2. Hot-Dip Galvanized Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
 3. Finish exposed fasteners to match appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.

- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
 - 1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

- A. Handrail Brackets: Cast iron center of handrail 2-1/4 inches from face of railing or wall.
- B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
- C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings."
- F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- G. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- H. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- I. Intermediate Coats and Topcoats: Provide products that comply with Section 099600 "High-Performance Coatings."
- J. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187/D1187M.
- K. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
 - 1. Clearly mark units for reassembly and coordinated installation.

2. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately.
 1. Remove burrs and ease edges to a radius of approximately **1/32 inch** unless otherwise indicated.
 2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water.
 1. Provide weep holes where water may accumulate.
 2. Locate weep holes in inconspicuous locations.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove flux immediately.
 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint
- I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Form changes in direction as follows:
 1. As detailed.
 2. By bending or .
 3. By radius bends of radius indicated or .
 4. By bending to smallest radius that will not result in distortion of railing member.
- K. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is **1/4 inch** or less.

- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
 - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 - 2. Coordinate anchorage devices with supporting structure.
- P. For railing posts set in concrete, provide stainless steel sleeves not less than **6 inches** long with inside dimensions not less than **1/2 inch** greater than outside dimensions of post, with metal plate forming bottom closure.
- Q. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.7 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
 - 4. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner and as follows.
 - 1. Comply with SSPC-SP 16.
- D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:
 - 1. Railings Indicated To Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3.

- F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 - 1. Shop prime uncoated railings with universal shop primer unless primers specified in Section 099600 "High-Performance Coatings" are indicated.
- G. Shop-Painted Finish: Comply with Section 099600 "High-Performance Coatings."
 - 1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
 - 1. Fit exposed connections together to form tight, hairline joints.
 - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 - 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 5. Set posts plumb within a tolerance of **1/16 inch in 3 feet**.
 - 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed **1/4 inch in 12 feet**.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending **2 inches** beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within **6 inches** of post.

3.4 ANCHORING POSTS

- A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than **5 inches** deep and **3/4 inch** larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

3.5 ATTACHING RAILINGS

- A. Attach handrails to walls with wall brackets. Provide brackets with **1-1/2-inch** clearance from inside face of handrail and finished wall surface.
 - 1. Use type of bracket with predrilled hole for exposed bolt anchorage.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

3.6 REPAIR

- A. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum **2.0-mil** dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in

3.7 CLEANING

- A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.8 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055213

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SECTION 061000 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Framing with dimension lumber.
2. Framing with engineered wood.
3. Wood blocking and nailers.
4. Wood furring.
5. Wood sleepers.

- B. Related Sections include the following:

1. Division 01 Section “Construction Waste Management and Disposal” for waste and reuse.
2. Division 06 Section “Sheathing”.

1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.

- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.

- C. 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.

1.4 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. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.

1.6 QUALITY ASSURANCE

A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Cover lumber to protect from rain and direct sun. Maintain water-tight cover until lumber is installed.

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 or omit grade stamp and provide certificates of grade compliance issued by grading agency.
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. 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.
- C. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPAC2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPAC31 with inorganic boron (SBX).
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 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 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 or omit marking and provide certificates of treatment compliance issued by inspection agency.
- 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 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. Furring.
 4. Grounds.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.
 - C. 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.
 - D. 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.
 - E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 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/A 153M.
 2. Where rough carpentry is incorporated in the Salt Shed, provide fasteners of Type 304 stainless steel.
- 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 (ASME B18.2.3.8M).
- F. Bolts: 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.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 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 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.5 METAL FRAMING ANCHORS

- 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. Alpine Engineered Products, Inc.
 2. Cleveland Steel Specialty Co.
 3. Harlen Metal Products, Inc.
 4. KC Metals Products, Inc.
 5. Simpson Strong-Tie Co., Inc.
 6. Southeastern Metals Manufacturing Co., Inc.
 7. USP Structural Connectors.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. 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.
- C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
1. Use for interior locations where stainless steel is not indicated.
- D. Stainless-Steel Sheet: ASTM A 666, Type 304.
1. Use for exterior locations and where indicated.
- E. Bridging: Rigid, V-section, nailless type, 0.050 inch (1.3 mm) thick, length to suit joist size and spacing.
- F. Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-1/2 inches (38 mm) wide by 0.050 inch (1.3 mm) thick. Tie fastens to side of rafter or truss, face of top plates, and side of stud below.
- G. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

2.6 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.
- 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. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos 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 nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Do not splice structural members between supports, unless otherwise indicated.
- D. 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 (406 mm) o.c.
- E. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- (38-mm actual-) thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
 - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) 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 AWWPA 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.

- 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.
- I. Use common wire 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; do not countersink nail heads, unless otherwise indicated.
- J. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- K. Coordinate plywood installation with installation of materials installed over plywood so plywood is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD 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.

3.3 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 wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

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SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Wall sheathing.
- 2. Roof sheathing.
- 3. Sheathing joint and penetration treatment.

- B. Related Requirements:

- 1. Division 06 Section "Rough Carpentry" for plywood backing panels and nailers.

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 plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
- 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

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.

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 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWPA 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.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 WALL SHEATHING

- A. Plywood Wall Sheathing: Exterior sheathing.
 - 1. Span Rating: Not less than 24/0.
 - 2. Nominal Thickness: Not less than 1/2 inch (13 mm), unless otherwise indicated on Drawings.

2.5 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior sheathing.
 - 1. Span Rating: Not less than 24/0.
 - 2. Nominal Thickness: Not less than 1/2 inch (13 mm), unless otherwise indicated on Drawings.

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. For roof and wall sheathing, provide fasteners of Type 304 stainless steel.

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. Use common wire 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. Install fasteners without splitting wood.
- 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.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.

END OF SECTION 061600

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SECTION 071113 – BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes asphalt dampproofing system including:
 - 1. Cold-applied, cut-back asphalt dampproofing with primer and fabric.
 - 2. Combination subsurface sheet drainage and protection panel.
- B. Related Sections include:
 - 1. Division 07 Section “Fluid-Applied Membrane Air Barriers” for transitions.
 - 2. Division 33 Section “Subdrainage” for drainage pipe, filter fabric, and fill.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include recommendations for method of application, primer, number of coats, coverage or thickness.
 - 2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of products.
- B. Material Certificate Letter: Signed by manufacturers.
 - 1. Statement of Compatibility: Provide letter confirming compatibility between bituminous dampproofing system and air barrier system, for transitions where systems intersect.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who is authorized, approved, or licensed by dampproofing manufacturer to install manufacturer's products.
- B. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.
- A. Mockups: Before installing exterior masonry wall and before procuring materials, build mockup to set quality standards for execution.
 - 1. Build mockup of typical wall area as indicated on Drawings and as required in Division 01 Section “Quality Requirements”.

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers' written instructions.
- B. Do not apply dampproofing to damp or wet substrate.

- C. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

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. Henry Company.
 - 2. Karnak Corporation.
 - 3. W.R. Meadows, Inc.

2.2 COLD-APPLIED, CUT-BACK ASPHALT DAMPPROOFING

- A. Trowel Coats: ASTM D4586/D4586M, Type I, Class 1, fibered.
- B. Brush and Spray Coats: ASTM D4479/D4479M, Type I, fibered.

2.3 MISCELLANEOUS MATERIALS

- A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Cut-Back Asphalt Primer: ASTM D 41.
- C. Emulsified-Asphalt Primer: ASTM D1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
- D. Asphalt-Coated Glass Fabric: ASTM D1668, Type I.
- E. Filter Fabric: Comply with Division 33 Section “Subdrainage”.

2.4 COMBINATION SUBSURFACE SHEET DRAINAGE AND PROTECTION PANEL

- A. Drainage Composite Panel: Manufactured, high-compressive-strength, non-biodegradable panel designed to conduct water to foundation drainage system under maximum soil pressure and protect waterproofing membrane. Panel is composed of non-woven polypropylene filter fabric bonded to molded polystyrene core. Panel allows passage of water through fabric, prevents fine soils from entering drainage channel and protects dampproofing membrane.
 - 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. Carlisle Coatings & Waterproofing, Inc., MiraDrain 6000XL or 6200XL.
 - b. W. R. Grace & Co., Hydroduct 220.
 - c. W. R. Meadows, Inc., Mel-Drain 5035.
 - d. Polyguard Products, Inc., PolyFlow.
 - 2. Physical Properties: As follows, measured per standard test methods referenced:
 - a. Flow rate of not less than 14.5 gpm (1.0 gradient) per foot of width at vertical wall pressure of 3600 psf; ASTM 4716.

- b. Thickness: 0.40 inch minimum; ASTM D 1777 or ASTM C366 method B.
- c. Tensile Strength: 100 lbs minimum; ASTM D4632.
- d. Compressive Strength: 15,000 lbs/sq.ft.; ASTM D 1621 modified.
- e. Fabric CBR Puncture Strength: 275 lbs; ASTM D 6241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
 - 1. Verify that concrete or mortar has cured and aged for minimum time period recommended by dampproofing manufacturer.
 - 2. Verify that concrete or mortar is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 3. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for dampproofing application.
- B. Clean substrates of projections and substances detrimental to work.
- C. Fill voids, seal joints, and apply bond breakers if any, as recommended by dampproofing manufacturer.
- D. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended by manufacturer, if required to achieve coverages indicated, and as required to completely and continuously coat substrate without voids, pinholes or gaps. Fill and spread around all joints, slots and grooves. Dampproofing shall penetrate into all crevices and corners.
 - 3. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.
- B. Apply dampproofing to footings and foundation walls and as indicated on Drawings.
 - 1. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches over outside face of footing.
 - 2. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat required for embedding fabric is in addition to other coats required.

- C. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.
 - 1. Lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
 - 2. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe, and lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.

3.4 COLD-APPLIED, CUT-BACK ASPHALT DAMPPROOFING

- A. On Unparged Masonry Foundation Walls: Apply primer and two brush or spray coats at not less than 1.25 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, or primer and one trowel coat at not less than 4 gal./100 sq. ft.
 - 1. Apply reinforcing fabric into first or primer coat.
- B. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft.

3.5 INSTALLATION OF COMBINATION DRAINAGE AND PROTECTION PANEL

- A. Install combination drainage and protection panel over completed-and-cured dampproofing. Comply with dampproofing material manufacturer's written recommendations for attaching panel. Support panel with spot application of trowel-grade mastic where not otherwise indicated. Lap edges and ends of geotextile to maintain continuity.
- B. Do not backfill or otherwise cover or conceal combination drainage and protection panel until review and acceptance by the manufacturer's technical representative and the architect.
- C. Install foundation drainage pipe, filter fabric, and fill materials in accordance with Division 33 Section "Subdrainage" and Drawings.

3.6 PROTECTION AND CLEANING

- A. Cover and secure top edges of drainage panels exposed to view until backfilling and final enclosure is complete. Keep drainage panels secured in place and fastened to substrate to prevent shifting or loosening.
- B. Do not permit foreign objects from entering cavity between drainage panel and dampproofing. Remove drainage panels and clean all cavities where foreign substances have entered cavity. Inspect dampproofing for damage and repair as required before re-installing drainage panels.
- C. Do not permit foot or vehicular traffic on unprotected dampproofing. Protect dampproofing from damage and wear during remainder of construction period.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
- E. Conduct backfilling operations in a manner that does not damage or compromise dampproofing system.

END OF SECTION 071113

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Extruded polystyrene foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Spray-applied cellulosic insulation.

- B. Related Requirements:

1. Section 042000 "Unit Masonry" for insulation installed in masonry cells.
2. Section 061600 "Sheathing" for foam-plastic board sheathing installed directly over wood or steel framing.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:

1. Extruded polystyrene foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Spray-applied cellulosic insulation.

- B. Sustainable Design Submittals:

1. [Product Data](#): For adhesives, indicating VOC content.
2. [Laboratory Test Reports](#): For adhesives, indicating compliance with requirements for low-emitting materials.
3. GREENGUARD GOLD for each product.
4. Health Product Declaration: For each product.

1.4 INFORMATIONAL SUBMITTALS

- A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.

1. For blown-in or sprayed fiberglass and cellulosic-fiber loose-fill insulation, indicate initial installed thickness, settled thickness, settled R-value, installed density, coverage area, and number of bags installed.
 2. Sign, date, and post the certification in a conspicuous location on Project site.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Research Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

- A. Extruded Polystyrene Board Insulation, Type IV : ASTM C578, Type IV, **25-psi** minimum compressive strength; unfaced.
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. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Kingspan Insulation Limited.
 - d. Owens Corning.
 2. Provide insulation with minimum aged R value of 5/ inch thickness at 75 degrees Fahrenheit.
 3. Adhesive: Type recommended by insulation board manufacturer for application indicated with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates. Adhesive to be applied with notched trowel over entire wall surface.
 4. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 5. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
 6. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 MATERIALS

2.3 A. Pre-engineered metal building insulation system consists of Batt Insulation, Roof Insulation, Wall Insulation, Vapor Barrier Liner Fabric, Thermal Breaks, Straps, and other devices and components in a proprietary insulation system as follows:

A. Batt Insulation: ASTM C 991 Type 1; preformed formaldehyde-free glass fiber batt conforming to the following:

1. Thermal Resistance: As indicated on drawings.
2. Batt Size: Equal to purlin/girt spacing by manufacturer's standard lengths.
3. Unfaced.

B. Roof Insulation: Formaldehyde-free fiberglass batt or fiberglass blanket complying with ASTM C 991 Type 1 and ASTM E 84 with a thermal resistance and thickness as follows:

1. As indicated on the drawings.

C. Wall Insulation: Formaldehyde-free fiberglass blanket or batt complying with ASTM C 991 Type 1, ASTM E 136 and ASTM E 84 with a thermal resistance and thickness as follows:

1. As indicated on the drawings.

D. Vapor Barrier Liner Fabric: Syseal® type woven, reinforced, high-density polyethylene yarns coated on both sides with a continuous white or colored polyethylene coatings, as follows:

1. Product complies with ASTM C 1136, Types I through Type VI.
2. Perm rating: 0.02 for fabric and for seams in accordance with ASTM E
3. Flame/Smoke Properties:
 - a. 25/50 in accordance with ASTM E 84.
 - b. Self-extinguishes with field test using matches or butane lighter.
4. Ultra violet radiation inhibitor to minimum UVMAX® rating of 8.
5. Size and seaming: Manufactured in large custom pieces by extrusion welding from roll goods, and fabricated to substantially fit defined building area with minimum practicable job site sealing.
6. Provide with factory double, extrusion welded seams. Stapled seams or heat-melted seams are not acceptable due to degradation of fabric.
7. Factory-folded to allow for rapid installation.
8. Vapor Barrier Lap Sealant: Solvent-based, Simple Saver polyethylene fabric adhesive.

2.4 INSULATION FASTENERS

A. General, Sustainability Requirement: VOC limit for each adhesive, sealant and sealant primer product used inside the air barrier system shall comply with requirements of Division 1 "Sustainability Requirements" and with the following:

1. Adhesives for plastic foam substrates: VOC of 50 g/L or less
 2. Adhesives for fiberglass substrates: VOC of 80 g/L or less
 3. Special purpose contact adhesives: VOC of 250 g/L or less
- B. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
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. AGM Industries, Inc.
 - b. Eckel Industries of Canada.
 - c. Gemco.
 2. Plate: Perforated, galvanized carbon-steel sheet, **0.030 inch** thick by **2 inches** square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; **0.105 inch** in diameter; length to suit depth of insulation.
- C. Insulation-Retaining Washers: Self-locking washers formed from **0.016-inch-** thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than **1-1/2 inches** square or in diameter.
1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Crawl spaces.
 - b. Ceiling plenums.
 - c. Attic spaces.
- D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of **2 inches** between face of insulation and substrate to which anchor is attached.
- E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.
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. AGM Industries, Inc.
 - b. Gemco.

2.5 ACCESSORIES

- A. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
1. **Verify adhesives have a VOC** content of 70 g/L or less.
 2. **Verify adhesive complies with the** testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- 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. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
 - 1. Fill above tops of all walls to underside of deck with mineral wool at all walls scheduled to be insulated or adjacent to return air plenums.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.
- E. Coordinate insulation installation to access areas that are made inaccessible by subsequent construction.
- F. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.
- G. Install insulation in thickness required to coordinate with adjacent construction and to provide the minimum aged R-value as follows, or as indicated in drawings, whichever is greater:
 - 1. Exterior CMU walls, above grade: R-9.5 continuous
 - 2. Exterior framed walls, above grade: R-13 between framing + R-10 continuous
 - 3. Slab-on-grade, unheated, perimeter: R-15 continuous for 24" or to top of footing.
- H. Install foil-faced batt insulation at all areas where insulation will remain uncovered by other surfaces and exposed to cavities and other interstitial spaces including but not limited to wall areas above acoustical ceilings. This does not apply to acoustical batt insulation.
- I. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

3.3 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately **24 inches** o.c. both ways on inside face and as recommended by manufacturer.
 - 1. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
 - 2. Press units firmly against inside substrates.
 - 3. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions.
- B. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain **3-inch** clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed **96 inches**, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately **2.5 lb/cu. ft.**
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.5 INSTALLATION OF SPRAY-APPLIED INSULATION

- A. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.6 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- C. Provide adequate protection of board insulation as recommended by manufacturer, including but not limited to, compatible waterproof tape at exposed foam surfaces, including corners, window and door openings, if insulation is left exposed longer than the amount of exposure time that is approved by the manufacturer.
- D. Remove and replace insulation that becomes wet.

END OF SECTION 072100

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SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Formed roof-drainage sheet metal fabrications.
2. Formed steep-slope roof sheet metal fabrications.
3. Formed wall sheet metal fabrications.
4. Formed equipment support flashing.

- B. Related Requirements:

1. Division 04 Section “Unit Masonry” for installing through-wall flashing and other sheet metal flashing and trim.
2. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
3. Division 07 “Joint Sealants” for field-applied sheet metal flashing and trim sealants.
4. Division 13 “Metal Building Systems” for gutters, downspouts and sheet metal flashing and trim specified with the metal building system.

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
 3. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than **3 inches per 12 inches**.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. Mockups: Before installing exterior masonry wall and before procuring materials, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings and as required in Section 014000 “Quality Requirements”.
2. Coordinate mockup to include building components specified in other sections as required in Section 014000 “Quality Requirements”.

1.6 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

- C. No sheet metal item is to be purchased, fabricated, or installed until all required shop drawings and related submittals for each item are approved by Architect. Items purchased, fabricated and/or installed which are not in compliance with approved shop drawings are subject to immediate removal from the project at contractor's expense.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Provide mockup samples of typical sheet metal flashings and trim as shown on Drawings.
 - 2. Provide additional mockups in mockup wall as required for exterior integrated mockup specified in Division 01 "Quality Requirements".
 - 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.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.
- C. Protect all materials from the weather and staining. All damaged or stained materials shall be replaced at no cost to the Owner.

1.10 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows 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 **Final Acceptance**.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: As indicated on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent 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.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. Wind Resistance: Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
 - 1. Wind Zone 1: For velocity pressures of 21 to 30 lbf/sq. ft. (1.00 to 1.44 kPa): 60-lbf/sq. ft. (2.87-kPa) perimeter uplift force, 90-lbf/sq. ft. (4.31-kPa) corner uplift force, and 30-lbf/sq. ft. (1.44-kPa) outward force.
- F. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275); prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Surface: Smooth, flat.
 - 2. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 3. Color: As selected by Architect from manufacturer's full range of 64 available colors minimum. Architect will select two (2) colors to coordinate with adjacent exterior finishes.
 - 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 minimum total dry film thickness of 0.5 mil (0.013 mm).
 - 5. Locations: Roofing and metal wall panel flashing and trim, except use stainless steel at through-wall flashing locations.

- C. **Prefinished Galvanized Steel: Smooth commercial quality galvanized steel (ASTM A653), Coating Class G-90, primed both sides. Metal is to be masked with protective plastic film.**
 - 1. Surface: Smooth, flat.
 - 2. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 3. Color: As selected by Architect from manufacturer's full range of 64 available colors minimum. **Architect will select one (1) color to coordinate with adjacent exterior finishes.**
 - 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 minimum total dry film thickness of **0.5 mil (0.013 mm)**.
- D. **Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface.**
 - 1. Finish: 2D (dull, cold rolled).
 - 2. Used at all through-wall flashing locations

2.3 UNDERLAYMENT MATERIALS

- A. **Self-Adhering, High-Temperature Sheet: Minimum 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.**
 - 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C).
 - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C).
 - 3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
 - e. Owens Corning; WeatherLock Metal High-Temperature Underlayment.

2.4 MISCELLANEOUS MATERIALS

- A. **General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.**
- B. **Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.**

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel.
4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
5. Fasteners for masonry substrates: ¼ inch by length required for 1 inch penetration into masonry, expansion type anchor with stainless steel nail. Rawl Zamac Nailin fastener or equal.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60 or Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, 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.

E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Fabricate sheet metal sections in 10-foot lengths, except where shorter lengths are required by construction.
- D. All exposed edges of sheet metal shall be folded back, or hemmed, on concealed surfaces.
- E. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- F. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- G. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- H. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- I. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.
- J. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- K. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.
- L. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- (2400-mm-) long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
 - 1. Gutter Size: As indicated on Drawings.
 - 2. Gutter Profile: Style D according to SMACNA's "Architectural Sheet Metal Manual."
 - 3. Expansion Joints: Butt type.
 - 4. Gutters with Girth 16 to 20 Inches (410 to 510 mm): Fabricate from the following materials:
 - a. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.
- B. Downspouts: Fabricate round downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors. Shop fabricate elbows.

1. Downspout Size: 4-inch diameter.
2. Fabricated Hanger Style: Fig 1-35D according to SMACNA's "Architectural Sheet Metal Manual."
 - a. 1 inch flat stock mounted at 10-feet on center maximum; minimum of 2 hanger straps per downspout.
3. Fabricate from the following materials:
 - a. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.

2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Drip Edges: Fabricate from the following materials:
 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
- B. Roof-Penetration Flashing: Fabricate from the following materials:
 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.

2.8 WALL SHEET METAL FABRICATIONS

- A. Brake Metal Flashings: Fabricate flashing as indicated on Drawings.
 1. Prefinished Galvanized Steel: 0.033 inch thick.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.

2.10 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. For the record, 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 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than **6 inches (150 mm)** staggered **24 inches (600 mm)** between courses. Overlap side edges not less than **3-1/2 inches (90 mm)**. Roll laps and edges with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Do not install sheet metal flashing and trim that is bent or otherwise deformed or damaged due to mishandling or improper storage.
 4. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 5. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 6. Install sealant tape where indicated.
 7. Torch cutting of sheet metal flashing and trim is not permitted.
 8. Do not use graphite pencils to mark metal surfaces.
- B. Coordinate all flashing installation with air-barrier, roof and other envelope assemblies. All flashing interface to be thoroughly sealed to other assemblies horizontally and vertically. All horizontal joints shall provide laps over top edges of flashing for positive water shedding away from building interior.
- C. Extend all penetrations to provide 8” minimum clearance above finished roof surface.
- D. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
 3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- E. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of **10 feet (3 m)** with no joints within **24 inches (600 mm)** of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with sealant concealed within joints.
- F. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- G. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- H. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than **1 inch (25 mm)** into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between **40 and 70 deg F (4 and 21 deg C)**, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below **40 deg F (4 deg C)**.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder metallic-coated steel and aluminum sheet.
 2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 3. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- J. Rivets: Rivet joints where indicated and where necessary for strength.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than **36 inches (900 mm)** apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Fasten gutter spacers to front and back of gutter.
 2. Loosely lock straps to front gutter bead and anchor to roof deck.
 3. Anchor and loosely lock back edge of gutter to continuous cleat.

4. Install gutter with expansion joints at locations indicated, but not exceeding, **50 feet (15.24 m)** apart. Install expansion-joint caps.

C. Downspouts: Join sections with **1-1/2-inch (38-mm)** telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately **60 inches (1500 mm)** o.c. in between.
2. Provide elbows at base of downspout to direct water away from building.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04 Section "Unit Masonry."

3.7 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.8 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of **1/4 inch in 20 feet (6 mm in 6 m)** on slope and location lines indicated on Drawings and within **1/8-inch (3-mm)** offset of adjoining faces and of alignment of matching profiles.

3.9 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as

recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Mildew-resistant joint sealants.
4. Butyl joint sealants.
5. Latex joint sealants.

B. Related Requirements:

1. Division 07 Section "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

- C. 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.

- D. Samples for Verification: For each kind 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.

1. Once Architect has narrowed the color selections down to those options appropriate to the Project, provide joint sealant options on Integrated Exterior Mockup Panel as described in Division 01 Section "Quality Requirements."

- E. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- B. Preconstruction Laboratory 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 are needed for adhesion.
- C. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- D. Field-Adhesion-Test Reports: For each sealant application tested.

1.6 QUALITY ASSURANCE

- A. Product Testing: Test joint sealants using a qualified testing agency.
 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- B. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
 1. Install sealant mockups in Integrated Exterior Mockup identified in Division 01 Section "Quality Requirements."

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Field-Adhesion Testing: Before installing 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 kind of sealant and joint substrate.
 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 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 X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 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. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind 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.

1.8 FIELD 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 or are below 40 deg F.
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: 20 years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from 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 JOINT SEALANTS, 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 joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content: Verify sealants and sealant primers comply with the following:

1. Architectural sealants have a VOC content of 250g/L or less.
2. Sealants and sealant primers for nonporous substrates have a VOC content of 250g/L or less.
3. Sealants and sealant primers for porous substrates have a VOC content of 775g/L or less.

- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range. Field-tinting is not acceptable.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
- B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
- C. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
- D. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
- E. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T and NT.

2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
- C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
- D. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

2.5 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311, US FED Spec TT-S01657.
 - 1. Compound shall be a single-component, gun-grade, curing, butyl-rubber sealant. Cured sealant shall have the following physical properties:
 - a. Elongation: ASTM D412 150%.
 - b. Hardness (Shore A): ASTM D642 40 minutes.
 - c. Shrinkage: TT-S-0011657 <5%.
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Bostik, Inc; Chem-Calk 300 or comparable product by, but not limited to, the following:
 - a. Pecora Corporation.

2.6 LATEX JOINT SEALANTS

- A. For interior use only.
- B. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 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. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - b. Pecora Corporation.
 - c. Tremco Incorporated.

2.7 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 - 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. Adfast.
 - b. Alcot Plastics Ltd.
 - c. BASF Corporation.
 - d. Construction Foam Products; a division of Nomaco, Inc.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) , and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

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: Nonstaining, 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 performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. 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:
 - 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, 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.
 - d. Exterior insulation and finish systems.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate 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.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer 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 JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind 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 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.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs 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 profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
 - 4. Provide flush joint profile at where indicated according to Figure 8B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at where indicated according to Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1000 feet of joint length thereafter or one 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 or Method A, Tail Procedure, in ASTM C 1521.

- a. 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.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. 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 kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 4. 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 material, sealant configuration, and sealant dimensions.
 5. 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-Adhesion-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 requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 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.

3.6 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, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
 1. Joint Locations:
 - a. Control and expansion joints in brick pavers.
 - b. Isolation and contraction joints in cast-in-place concrete slabs.
 - c. Joints between plant-precast architectural concrete paving units.
 - d. Joints in stone paving units, including steps.
 - e. Tile control and expansion joints.
 - f. Joints between different materials listed above.
 - g. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, S, NS, 100/50, T, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

4. For all sidewalks joints, use of zip strip joint material shall be utilized. No sealant shall be directly applied to the asphaltic board.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Control and expansion joints in unit masonry.
 - b. Joints in exterior insulation and finish systems.
 - c. Joints between metal panels.
 - d. Joints between different materials listed above.
 - e. Perimeter joints between materials listed above and frames of doors windows and louvers.
 - f. Control and expansion joints in ceilings and other overhead surfaces.
 - g. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Acrylic latex.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Concealed mastics.
1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Butyl-rubber based.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

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SECTION 079219 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes acoustical joint sealants.
- B. Related Requirements:
 - 1. Division 07 Section "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.3 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.
- B. Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. 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.
- D. Acoustical-Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Verify sealant has a VOC content of 250 g/L or less.

2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
 - 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. Accumetric LLC.
 - b. Pecora Corporation.
 - c. Tremco Incorporated.
 - d. USG Corporation.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.
- 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, 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 of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. 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.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer 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 ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.

- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

3.4 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 acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect acoustical 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, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079219

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SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes hollow-metal work.
- B. Related Requirements:
 - 1. Division 04 Section “Unit Masonry” for building anchors into and grouting hollow-metal frames in masonry construction.
 - 2. Division 08 Section "Door Hardware" for door hardware for hollow-metal doors.
 - 3. Division 08 Section “Glazing” for glazed lites in hollow-metal doors and frames.
 - 4. Division 09 Sections “Interior Painting” and “Exterior Painting” for field painting hollow-metal doors and frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal 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.

1.5 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of steel door and frame specified.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.

9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work 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.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify openings 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 opening dimensions and proceed with fabricating hollow-metal frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

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. Amweld International, LLC.
2. Benchmark by Therma-Tru; a division of Therma-Tru Corporation.
3. Ceco Door; an ASSA ABLOY Group Company.
4. Curries Company; an ASSA ABLOY Group Company.
5. Fleming Door Products, LTD; an ASSA ABLOY Group Company.
6. Steelcraft; an Ingersoll-Rand brand.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. At locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm.)
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.30 mm), with minimum G60 (Z180) or A60 (ZF180) coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 - 1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu (0.370 K x sq. m/W) when tested according to ASTM C 1363.
 - 3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.30 mm), with minimum G60 (Z180) or A60 (ZF180) coating.
 - b. Construction: Full profile welded.
 - 4. Exposed Finish: Prime.

2.3 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
 - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-(9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.4 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A60 zinc-iron-alloy (galvannealed) coating designation.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.
- 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 hollow-metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Fire Door Cores: As required to provide fire-protection ratings indicated.
 - 2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
 - 3. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
 - 4. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.

5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 6. Glazed Lites: Factory-cut openings in doors.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Sidelight and Borrowed-light 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 butt welding.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.
 - b. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c. Postinstalled anchors shall be provided with integral metal tubes welded to backing plates to prevent deformation of door frame.
 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.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow-metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.6 STEEL FINISHES

- A. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- B. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, “Solvent Cleaning”; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, “Power Tool Cleaning,” or SSPC-SP 6/NACE No. 3, “Commercial Blast Cleaning.”
- C. Factory Priming for Field-Painted 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.

2.7 ACCESSORIES

- A. Kerfed Stops: Provide frames with integral kerf at door side of door stop at all locations where door is indicated to be a sound sealed door, smoke-rated door or a fire rated door. Provide manufacture’s standard friction fit neoprene or rubber seal except provide alternate seal where required for door assembly rating.
- B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- C. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:
 - 1. Hinges: Minimum 0.123 inch (3.0 mm) thick by 1-1/2 inches (38 mm) wide by 6 inches (152 mm) longer than hinge, secured by not less than 6 spot welds.
 - 2. Pivots: Minimum 0.167 inch (4.2 mm) thick by 1-1/2 inches (38 mm) wide by 6 inches (152 mm) longer than hinge, secured by not less than 6 spot welds.
 - 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch (1.7 mm) thick.

4. Strikes: Minimum 0.067 inches thick by full height of door secured with spot welds at 4 inches o.c.
5. Closers: Minimum 0.093 thick channel, 1 1/2 “ wide by full width of header secured with spot welds 4 inches o.c.
6. All Other Surface-Mounted Hardware: Minimum 0.067 inch (1.7 mm) thick.

D. Supports and Anchors: Fabricated from metallic-coated steel sheet.

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.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

- C. 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.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

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SECTION 083613 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes electrically operated sectional doors.
- B. Related Requirements:
 - 1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.
 - 2. Division 26 Sections for electrical service and connections for powered operators and accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of sectional door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 - 4. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied finishes.
 - 1. Include Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, ICC A117.1, and North Carolina State Building Code.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors 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. Failure of components or operators before reaching required number of operation cycles.
 - c. Faulty operation of hardware.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
 - e. Delamination of exterior or interior facing materials.
 - 2. Warranty Period: Five years from date of Final Acceptance.
- B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Warranty Period: 10 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain sectional doors from single source from single manufacturer.
 - 1. Obtain operators and controls from sectional door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.
- B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
 - 1. Design Wind Load: As indicated on Drawings.

2. Testing: According to ASTM E 330.
 3. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
 - a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
 - b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.
 4. Operability after Wind Load: Design overhead sectional doors to remain operable after design wind load, acting inward and outward. Doors shall be closed before a high wind event.
- C. Windborne-Debris Impact Resistance: Provide glazed sectional doors that pass missile-impact and cyclic-pressure tests according to ASTM E 1886 and ASTM E 1996 for Wind Zone 3.

2.3 DOOR ASSEMBLY

- A. Steel Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise 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. Amarr Garage Doors.
 - b. C.H.I. Overhead Doors.
 - c. Clopay Building Products; a Griffon company.
 - d. Overhead Door Corporation.
 - e. Raynor.
- B. Operation Cycles: Door components and operators capable of operating for not less than 100,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
- C. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. (0.406 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E 283.
- D. Door Assembly R-Value: 2.0 deg F x h x sq. ft./Btu (2.642 K x sq. m/W).
- E. Steel Sections: Zinc-coated (galvanized) steel sheet with G90 (Z275) zinc coating.
1. Section Thickness: 1-3/4 inches (44 mm).
 2. Exterior-Face, Steel Sheet Thickness: 0.040-inch-(1.02-mm-) nominal coated thickness.
 - a. Surface: Manufacturer's standard ribbed.
 3. Insulation: Minimum 8.0 R-Value or greater as required to achieve total Door Assembly R-Value.
 4. Interior Facing Material: Zinc-coated (galvanized) steel sheet with a nominal coated thickness of 0.022 inch (0.56 mm).
- F. Track Configuration: Standard-lift track.

- G. Windows: Full vision sections in three rows at height indicated on Drawings; installed with glazing of the following type:
 - 1. Insulating Glass: Manufacturer's standard tempered insulated glazing. Thickness as required to achieve total Door Assembly R-Value.
- H. Roller-Tire Material: Neoprene or bronze.
- I. Locking Devices: Equip door with locking device assembly.
 - 1. Locking Device Assembly: Single-jamb side locking bars, operable from inside and outside, with cylinders.
- J. Counterbalance Type: Torsion spring.
- K. Electric Door Operator:
 - 1. Usage Classification: Light duty, up to 10 cycles per hour.
 - 2. Operator Type: Trolley.
 - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet (2.4 m) or lower.
 - 4. Motor Exposure: Exterior, dusty, wet, or humid.
 - a. NEMA 1 rating.
 - 5. Obstruction-Detection Device: Automatic electric sensor edge on bottom section; self-monitoring type.
 - a. Sensor Edge Bulb Color: As selected by Architect from manufacturer's full range.
 - 6. Control Station: Where indicated on Drawings.
- L. Door Finish:
 - 1. Manufacturer's standard Powder-Coat Finish: Color and gloss as selected by Architect from manufacturer's full range.
 - 2. Finish of Interior Facing Material: Finish as selected by Architect from manufacturer's full range.

2.4 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 STEEL DOOR SECTIONS

- A. Exterior Section Faces and Frames: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated zinc coating and thickness.
 - 1. Fabricate section faces from single sheets to provide sections not more than 24 inches (610 mm) high and of indicated thickness. Roll horizontal meeting edges to a continuous, interlocking,

keyed, rabbeted, shiplap, or tongue-in-groove weather-resistant seal, with a reinforcing flange return.

2. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.
- B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064-inch-(1.63-mm-)nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.064-inch-(1.63-mm-)thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches (1219 mm) apart.
 - C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile and allowing installation of astragal.
 - D. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place. Ensure that reinforcement does not obstruct vision lites.
 - E. Provide reinforcement for hardware attachment.
 - F. Foamed-in-Place Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard CFC-free polyurethane insulation, foamed in place to completely fill interior of section and pressure bonded to face sheets to prevent delamination under wind load, and with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within steel sections and the interior facing material, with no exposed insulation.
 - G. Interior Facing Material: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated thickness.
 - H. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

2.6 TRACKS, SUPPORTS, AND ACCESSORIES

- A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings, Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides for required door type, size, weight, and loading.
 1. Galvanized Steel: ASTM A 653/A 653M, minimum G60 (Z180) zinc coating.
 2. Slope tracks at an angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.
 3. Track Reinforcement and Supports: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches (51 mm) apart for door-drop safety device.
 - a. For Vertical Track: Continuous reinforcing angle attached to track and attached to wall with jamb brackets.

- b. For Horizontal Track: Continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.
- B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.
- C. Windows: Manufacturer's standard window units of type, size, and in arrangement indicated. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors and elastic glazing compound for wood doors, as required. Provide removable stops of same material as door-section frames.

2.7 HARDWARE

- A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.
- B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch-(2.01-mm-)nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible. Provide double-end hinges where required, for doors more than 16 feet (4.88 m) wide unless otherwise recommended by door manufacturer.
- C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch-(76-mm-)diameter roller tires for 3-inch-(76-mm-)wide track and 2-inch-(51-mm-)diameter roller tires for 2-inch-(51-mm-)wide track.
- D. Push/Pull Handles: Equip each push-up operated or emergency-operated door with galvanized-steel lifting handles on each side of door, finished to match door.

2.8 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: Cylinders standard with manufacturer and keyed to building keying system.
 - 2. Keys: Three for each cylinder.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.9 COUNTERBALANCE MECHANISM

- A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.
- B. Cables: Galvanized-steel, multistrand, lifting cables with cable safety factor of at least 5 to 1.
- C. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

- D. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.
- E. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

2.10 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.
 - 1. Trolley: Trolley operator mounted to ceiling above and to rear of door in raised position and directly connected to door with drawbar.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
 - 1. Electrical Characteristics:
 - a. Phase: Single Phase
 - b. Volts: 120 V.
 - c. Hertz: 60.
 - 2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
 - 3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 - 4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
 - 5. Use adjustable motor-mounting bases for belt-driven operators.
- E. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.

1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom section. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire configured device designed to interface with door-operator control circuit to detect damage to or disconnection of sensor edge.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure, push-button control labeled "Close."
 1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Manual Operation: Equip electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" 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.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Tracks:
 - 1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches (610 mm) apart.
 - 2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
- C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Doors: Install according to UL 325.

3.3 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.
- D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780/A 780M.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 083613

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PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:
 - 1. Aluminum-framed storefront systems.
 - 2. Aluminum-framed entrance door systems.

2.3 PREINSTALLATION MEETINGS

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

2.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
 - 4. Include point-to-point wiring diagrams showing the following:
 - a. Power requirements for each electrically operated door hardware.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
- C. Samples for Initial Selection: For units with factory-applied color finishes.

- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- F. Delegated-Design Submittal: For aluminum-framed entrances and storefronts including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

2.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data:
 - 1. For Installer .
 - 2. For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.
- B. Sample Warranties: For special warranties.

2.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.
- B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

2.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and that employs a qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.
- B. 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.
- C. Structural-Sealant Glazing: Comply with ASTM C1401 for design and installation of storefront systems that include structural glazing.

2.8 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts 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 wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E 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, peeling, or chipping.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 3 - PRODUCTS

3.1 MANUFACTURERS

- A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels venting windows and accessories, from single manufacturer.

3.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. All test unit sizes and configurations shall conform to the minimum sizes in accordance with; Florida High Velocity Hurricane Zone (HVHZ) Protocols, ASTM E 1886, ASTM E 1996, and/or meet all requirements of TAS 201, TAS
- C. 202, and TAS 203. They shall also comply with the following specific performance requirements indicated.
- D. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- E. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings .
- F. Deflection of Framing Members Supporting Glass: At design wind load, as follows:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches .
 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch .
 3. Cantilever Deflection: Limited to 2l/175 at unsupported cantilevers.
- G. Structural: Test according to ASTM E330/E330M as follows:
1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- H. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 .
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
- I. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor):
 - a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.41 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
 - b. Entrance Doors: U-factor of not more than 0.68 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
 2. Solar Heat-Gain Coefficient (SHGC):

- a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.35 as determined according to NFRC 200.
 - b. Entrance Doors: SHGC of not more than 0.35 as determined according to NFRC 200.
 - 3. Air Leakage:
 - a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested according to ASTM E283.
 - b. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
 - 4. Condensation Resistance Factor (CRF):
 - a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined according to AAMA 1503.
 - b. Entrance Doors: CRF of not less than 57 as determined according to AAMA 1503.
- J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
- 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
 - 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F .
 - b. Low Exterior Ambient-Air Temperature: 0 deg F .
 - c. Interior Ambient-Air Temperature: 75 deg F .
- K. Structural-Sealant Joints:
- 1. Designed to carry gravity loads of glazing.
- L. Structural Sealant: ASTM C1184. Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed, aluminum-framed entrances and storefronts without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
- 1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
 - 2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate, because sealant-to-substrate bond strength exceeds sealant's internal strength.

3.3 STOREFRONT SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide YKK AP America Inc; YES 45 TU or comparable product by one of the following:
 - 1. EFCO Corporation.
 - 2. Kawneer North America, an Arconic company.
 - 3. Tubelite Inc.

4. Wausaw Window and Door Systems.
- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 1. Exterior Framing Construction: Thermally broken .
 2. Interior Vestibule Framing Construction: To accept 1inch insulating glazing .
 3. Glazing System: Retained mechanically with gaskets on four sides .
 4. Glazing Plane: Center .
 5. Finish: Clear anodic finish .
 6. Fabrication Method: Field-fabricated stick system.
 7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 8. Steel Reinforcement: As required by manufacturer.
 9. Size: 2 inches x 4 1/2 inches.
 - A. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
 1. Location: At interior storefront assemblies.
 - B. Receptors / Starters: Manufacturer's continuous receptor or starter along head and jamb where framing abuts adjacent construction.
 1. Receptor/ Starters to have end caps.
 2. Location: Location: At exterior storefront assemblies.
 - C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

1.2 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

1.3 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Comply with Section 088000 "Glazing."
- C. Structural Glazing Sealants: ASTM C1184 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: As selected by Architect from manufacturer's full range of colors .

1.4 MATERIALS

- A. Sheet and Plate: ASTM B209.
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
- C. Structural Profiles: ASTM B308/B308M.
- D. Steel Reinforcement:
 - 1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
- E. Steel Reinforcement Primer: 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.

1.5 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. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

1.6 FABRICATION

- A. Form or extrude 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. Fabricate components that, when assembled, have the following characteristics:
 - 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 from exterior .
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

- E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- F. Storefront Framing: Fabricate components for assembly using shear-block system .
- G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At interior and exterior doors, provide compression weather stripping at fixed stops.
- H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

1.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

1.8 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 2 - EXECUTION

2.1 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.

2.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions.
- B. Do not install damaged components.

- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Seal perimeter and other joints watertight unless otherwise indicated.
- G. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.
- I. Install joint filler behind sealant as recommended by sealant manufacturer.
- J. Install components plumb and true in alignment with established lines and grades.

2.3 INSTALLATION OF OPERABLE UNITS

- A. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

2.4 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 088000 "Glazing."

2.5 INSTALLATION OF STRUCTURAL GLAZING

- A. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
- B. Set glazing into framing according to sealant manufacturer and framing manufacturer's written instructions and standard practice. Use a spacer or backer as recommended by manufacturer.
- C. Set glazing with proper orientation so that coatings face exterior or interior as specified.
- D. Hold glazing in place using temporary retainers of type and spacing recommended by manufacturer, until structural sealant joint has cured.
- E. Apply structural sealant to completely fill cavity, according to sealant manufacturer and framing manufacturer's written instructions and in compliance with local codes.

- F. Apply structural sealant at temperatures indicated by sealant manufacturer for type of sealant.
- G. Allow structural sealant to cure according to manufacturer's written instructions.
- H. Clean and protect glass as indicated in Section 088000 "Glazing."

2.6 INSTALLATION OF WEATHERSEAL SEALANT

- A. After structural sealant has completely cured, remove temporary retainers and insert backer rod between lites of glass as recommended by sealant manufacturer.
- B. Install weatherseal sealant to completely fill cavity, according to sealant manufacturer's written instructions, to produce weatherproof joints.

2.7 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

- A. Install entrance 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.

2.8 ERECTION TOLERANCES

- A. Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 084113

SECTION 084523 - FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the insulated, translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:
 - 1. Walls
 - a. Flat insulated, translucent sandwich panels
 - b. Aluminum clamp-tite installation system
 - c. Aluminum sill flashing
- B. Related Sections:
 - 1. Division 05 “Structural Steel Framing”
 - 2. Division 05 “Cold Formed Metal Framing”
 - 3. Division 05 “Metal Fabrication”
 - 4. Division 06 “Rough Carpentry”
 - 5. Division 07 “Joint Sealants”
 - 6. Division 08 “Glazing”

1.2 SUBMITTALS

- A. Submit manufacturer’s product data. Include construction details, material descriptions, profiles, and finishes of components.
- B. Submit shop drawings. Include plans, elevations, and details.
- C. Submit manufacturer’s color charts showing the full range of colors available for factory finished exposed aluminum.
 - 1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below.
 - a. Sandwich panels: 7” x 12” units
 - b. Factory finished aluminum: 3” long sections
- D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
- E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.
 - 1. Reports required are:
 - a. Color Difference (ASTM D 2244)
 - b. Insulation U-Factor (NFRC 100)
 - c. NFRC System U-Factor Certification (NFRC 700)

- d. NFRC Visible Light Transmittance (NFRC 202)
- e. Solar Heat Gain Coefficient (NFRC or Calculations)
- f. Condensation Resistance Factor (AAMA 1503) (Thermally Broken, insulated panels only)
- g. Air Leakage (ASTM E 283)
- h. Water Penetration (ASTM E 331)

1.3 CLOSEOUT SUBMITTALS

- A. Provide field maintenance manual to include in project maintenance manuals.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

- 1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope, and location. At least three of the projects shall have been in successful use for ten years or longer.
- 2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural, and water infiltration testing of sandwich panel systems by an accredited agency.
- 3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components, and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

- B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing insulated translucent sandwich panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope, and type.

1.5 PERFORMANCE REQUIREMENTS

- A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

- 1. When requested, include span analysis data.
- 2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
- 3. Structural Loads (Walls). Provide system capable of handling the following loads:
 - a. Positive Wind Load (PSF): 120 PSF
 - b. Negative Wind Load (PSF): 120 PSF

B. Deflection Limits:

- 1. Walls: Limited to L/60 of clear span for each assembly component.

- C. Windborne Debris Impact Resistance Performance: Translucent panels must be impact-resistant meeting the requirements of an approved impact-resisting standard: ASTM E 1996 and ASTM E 1886 or TAS 201, 202 and 203.
 - 2. Panel System designed to meet Large Missile Test per ASTM E 1996.
- D. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 110 deg F (43 deg C), ambient; 150 deg F (66 deg C), material surfaces.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver panel system, components, and materials in manufacturer's standard protective packaging.
- B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of panel assemblies that fail in materials or fabrication 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. Deterioration of metals and other materials beyond normal weathering.
 - c. Water leakage.
 - 2. Warranty Period: Five years from date of Substantial Completion.
- B. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace translucent polycarbonate panels that exhibit defects in materials or workmanship within specified warranty period.
 - 1. Defects include, but are not limited to, the following:
 - a. Delamination.
 - b. Color changes exceeding requirements.
 - c. Losses in light transmission beyond 6 percent from original when measured after 10 years according to ASTM D 1003.
 - 2. Warranty Period: 10 years from date of Substantial Completion.
 - 3. Warranty Period for Hail Damage: Five years from date of Substantial Completion for hail stone penetration exceeding requirements.
- C. Special Aluminum-Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
 - 1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
 - 2. Warranty Period: 10 years from date of Substantial Completion.
- D. Installer's Warranty: Installer agrees to repair or replace components of panel assemblies that fail in installation workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, installation defects and water leakage.

2. Warranty Period: Five years from date of Substantial Completion.

1.8 PRODUCT HANDLING

- A. Store panels on long edge, several inches above the ground, blocked and under cover to prevent damage. Follow manufacturer's storage and handling instructions.
- B. No field fabrication of, or modification of, the panels shall be allowed without the express written authorization of the design architect.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kalwall or a comparable product by one of the following:
 1. CPI Daylighting, Inc.
 2. Sunlite
 3. MBCI
- B. All manufacturers able to comply fully with the performance requirements and material requirements specified are approved for use on the project.
- C. Requests for deviations from the performance criteria specified must include all test data substantiating equality with, or superiority to, performance specified. Incomplete submittal shall be cause for rejection. No reduction of performance level will be considered. Approval of any modification will be by written addendum. No verbal approvals will be given.
- D. Manufacturers are cautioned that if any deviations are approved, all other performance criteria, not specifically addressed by addendum, shall remain in full force. If for any reason the manufacturer cannot comply with remaining requirements, they are not acceptable for use on the project and are precluded from bidding.

2.2 PANEL COMPONENTS

- A. Face Sheets:
 1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
 - a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
 - b. Face sheets shall not deform, deflect, or drip when subjected to fire or flame.
 2. Interior face sheets:
 - a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 50 and smoke developed no greater than 450 when tested in accordance with UL 723.
 - b. Burn extent by ASTM D 635 shall be no greater than 1”.
 3. Exterior face sheets:
 - a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida

weathering at 5° facing south as measured on a white sample, with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.

- b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
 - c. Strength: Exterior face sheet shall be uniform in strength, with panel meeting ASTM E1996 and ASTM E1886 or TAS 201, 202 and 203.
 - d. Erosion Protection: Integral, embedded-glass erosion barrier.
4. Appearance:
- a. Exterior face sheet: Smooth, 2 3/4" thick and clear matte over clear matte in color.
 - b. Interior face sheet: Smooth, 2 3/4" thick and clear matte over clear matte in color.
 - c. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.

B. Grid Core:

1. Aluminum I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
2. I-beam Thermal break: Minimum 1", thermoset fiberglass composite. Poured and de-bridged thermal break is not acceptable.

C. Laminate Adhesive:

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
 - a. 50% Relative Humidity at 68° F: 540 PSI
 - b. 182° F: 100 PSI
 - c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
 - d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.3 PANEL CONSTRUCTION

A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.

1. Thickness: 2-3/4 inches
2. Grid Core Insulation: Fill panel cores with air
3. FRP Face Sheet: Crystal Exterior, Crystal Interior
4. Panel U-factor by NFRC certified laboratory:
 - a. 2-3/4" thermally broken grid: U-factor 0.53
5. Complete insulated panel system shall have NFRC certified U-factor of 0.53
6. Visible Light Transmittance (VLT):
 - a. Visible LT (NFRC 202) by NFRC certified laboratory: 58 % for Crystal/Crystal
7. Solar heat gain coefficient: 0.60
8. Grid pattern as viewed: Nominal size 24" wide X 12" tall

- B. Standard panels shall deflect no more than 1.9” at 30 PSF in 10’-0” span without a supporting frame by ASTM E 72.
- C. Panels shall meet the conditions of acceptance according to ASTM E2707 Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure:
 - 1. Absence of flame penetration through the wall assembly at any time.
 - 2. Absence of evidence of glowing combustion on the interior surface of the assembly at the end of the 60-min observation period.
 - 3. Absence of evidence of flame, glow, and smoke if the test is terminated prior to the completion of the 60-min observation period.
- D. Thermally broken, insulated panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

2.4 ALUMINUM CLAMPTITE INSTALLATION SYSTEM

- A. Aluminum clamp-tite installation system (Wall):
 - 1. Standard-Flat extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
- B. Sealing tape: Manufacturer's standard, pre-applied to aluminum clamp-tite installation system at the factory under controlled conditions.
- C. Fasteners: 300 series stainless steel screws for aluminum clamp-tite installation system, excluding final fasteners to the building.
- D. Finish:
 - 1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected by Architect from manufacturer's standards.
 - 2. Anodized

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installer shall examine substrates, supporting structure, and installation conditions.
- B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by sealant manufacturer for this purpose.
 - 2. Where aluminum will contact concrete, masonry, or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by sealant manufacturer.

3.3 INSTALLATION

- A. Install the panel system in accordance with the manufacturer's fabrication drawings and suggested installation instructions.
 - 1. Anchor component parts securely in place by permanent mechanical attachment system.
 - 2. Accommodate thermal and mechanical movements.
 - 3. Seal aluminum clamp-tite installation system as shown on the manufacturer's fabrication drawings and suggested installation instructions.
- B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's fabrication drawings and suggested installation instructions.

3.4 FIELD QUALITY CONTROL

- A. Water Test: Installer to test a representative section of installed materials according to procedures in AAMA 501.2.
- B. Repair or replace work that does not pass testing or that is damaged by testing and retest work.

3.5 CLEANING

- A. Clean the panel system, interior and exterior, immediately after installation.
- B. Refer to manufacturer's written recommendations.

END OF SECTION 084523

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SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - 2. Electrified door hardware.
 - 3. Miscellaneous door hardware.
- B. Related Sections include the following:
 - 1. Division 08 Section "Hollow Metal Doors and Frames" for astragals provided as part of labeled fire-rated assemblies.
 - 2. Division 08 Section "Sectional Doors" for door hardware provided as part of overhead door assemblies.
 - 3. Division 08 Section "Door Hardware Schedule".

1.3 ACTION SUBMITTALS

- A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Submittal Sequence: Submit door hardware schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. The Contractor's attention shall be drawn to the lead time required for delivery of certain hardware items and the required date of Completion.
 - a. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
 - b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.

c. Content: Include the following information:

- 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
- 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
- 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
- 4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
- 5) Fastenings and other pertinent information.
- 6) Explanation of abbreviations, symbols, and codes contained in schedule.
- 7) Mounting locations for door hardware.
- 8) List of related door devices specified in other Sections for each door and frame.

2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

- C. Samples for Initial Selection: For each finish, color, and texture required for each type of door hardware indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For firms and persons specified in “Quality Assurance” Article.

1. Include lists of completed projects with project names and addresses of architects and owners, and other information specified.

- A. Product Certificates: For electrified door hardware, from the manufacturer.

1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

- B. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

- C. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedules.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 1. Warehousing Facilities: In Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 - 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- C. Source Limitations: Obtain each type of door hardware from a single manufacturer, unless otherwise indicated.
 - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- D. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- F. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- G. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the Department of Justice's 2010 ADA Standards for Accessible Design, the North Carolina State Building Code Accessibility Chapter, and ICC/ANSI A117.1.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high. A 1/2-inch-high threshold is permitted to be 1/4-inch vertical plus 1/4-inch beveled not more than 1:2.

4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch.

H. Keying Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." In addition to Owner, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Requirements for access control.
5. Address for delivery of keys.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

1.8 COORDINATION

- A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, and access control system.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of operators and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - d. Warranty Period: Three years from date of **Final Acceptance**.
 - e. Warranty Period for Manual Closers: 10 years from date of **Final Acceptance**.
 - f. Warranty Period for Exit Devices: Three (3) years from date of **Final Acceptance**.

1.10 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Section 087111 "Finish Hardware Schedule."
 - 1. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Section 087111 "Door Hardware Schedule." Products are identified by using 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 the preface of Section 087111 "Door Hardware Schedule." Deviations from the scheduled items/manufacturers generally will not be permitted except as provided for under Substitutions and when the Owner will benefit both from a quality and monetary standpoint.
 - 2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

2.2 MATERIALS AND FABRICATION, GENERAL

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Hand of door: The drawings show the direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door movement as shown.
- C. Base Metals: Produce hardware units of the basic metal and forming method indicated, using the manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units by ANSI/ BHMA, A156 series standards. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
- D. Fasteners: Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
- E. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces of other work, to match the finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

- F. Provide concealed fasteners for hardware units that are exposed when the door is closed, except to the extent no standard units of the type specified are available with concealed fasteners. Do not use through-bolts for installation where the bolt head or the nut on the opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. Provide thru bolt fasteners at all closers only.
- G. Tools for Maintenance: Furnish a complete set of specialized tools as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.

2.3 HINGES

- A. Quantity: Provide the following, unless otherwise indicated:
 - 1. Four Hinges: For doors with widths greater than 36 inches (914 mm).
 - 2. Three Hinges: For doors with widths 36 inches (914 mm) or less and heights 61 to 90 inches (1549 to 2286 mm).
 - 3. Four Hinges: For doors with widths 36 inches (914 mm) or less and heights 91 to 120 inches (2311 to 3048 mm).
- B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- C. Hinges: BHMA A156.1.

2.4 CONTINUOUS HINGES

- A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch-(3.0-mm-)thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
- B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

2.5 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
 - 2. Deadbolts: Minimum 1-inch (25-mm) bolt throw.
- C. Lock Backset: 2-3/4 inches (70 mm), unless otherwise indicated.
- D. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
- E. Mortise Locks: BHMA A156.13; Stamped steel case with steel or brass parts; Heavy-duty.

2.6 SURFACE BOLTS

- A. Surface Bolts: BHMA A156.16.

2.7 MANUAL FLUSH BOLTS

- A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

2.8 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3, Grade 1.
- B. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- C. Removable Mullions: BHMA A156.3.
- D. Outside Trim: Pull with cylinder; material and finish to match locksets, unless otherwise indicated.
 - 1. Match design for locksets and latchsets, unless otherwise indicated.

2.9 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
 - 1. Manufacturer: Same manufacturer as for locking devices.
 - 2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 - 3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
- B. Standard Lock Cylinders: BHMA A156.5; Grade 1; permanent cores that are interchangeable; face finished to match lockset.
- C. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.10 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 - 1. Master Key System: Change keys and a master key operate cylinders.
 - 2. Keyed Alike: Key all cylinders to same change key.
- B. Keys: Nickel silver.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

- a. Notation: "DO NOT DUPLICATE."
 - b. Factory to stamp key with key number.
2. Quantity: In addition to one extra key blank for each lock, provide the following:
- a. Master Keys: Five.
 - b. Cylinder Change Keys: Three.
 - c. Each Submaster Set: Three.
 - d. Minimum of 30 keys for each different keyway.

2.11 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.5; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.
 1. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.
- B. Key Lock Boxes: Designed for storage of two keys.
 1. Provide recessed key lock box, "Knox Series 4400 Recessed Mount" or equal. Finish to be clear anodized aluminum. Install where indicated on floor plan. Keying shall be coordinated with the Owner to match Owners keying.

2.12 OPERATING TRIM

- A. Standard: BHMA A156.6.
- B. Materials: Fabricate from stainless steel, unless otherwise indicated.

2.13 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4, Grade 1; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 1. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.

2.14 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16, Grade 1.
 1. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.

- B. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame.

2.15 OVERHEAD STOPS AND HOLDERS

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

2.16 DOOR GASKETING

- A. Standard: BHMA A156.22.
- B. General: Provide continuous weather-strip gasketing on exterior doors. Provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
 - 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 2. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
 - 3. Provide interlocking compressible gaskets at all hollow kerfed metal door frames.
- C. Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
- D. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Gasketing Materials: ASTM D 2000 and AAMA 701/702.

2.17 PROTECTIVE TRIM UNITS

- A. Size: 1-1/2 inches (38 mm) less than door width on push side and 1/2 inch (13 mm) less than door width on pull side, by height specified in door hardware sets.
- B. Fasteners: Manufacturer's approved standard methods.
- C. Plastic Protective Trim Units: BHMA A156.6; beveled 4 sides; fabricated from material indicated in door hardware sets.
- D. Metal Protective Trim Units: BHMA A156.6; fabricated from material indicated in door hardware sets.

2.18 THRESHOLDS

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

2.19 MISCELLANEOUS DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16, Grade 1.

2.20 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

2.21 FINISHES

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

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

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 Series.
 - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying schedule.
 - 2. Furnish permanent cores to Owner for installation.
- D. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- E. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
 - 1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.
- F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- G. Access-Control Devices: Connect access-control devices to access-control system as specified in Division 26 Sections.
- H. Signage: Apply signage on both sides of each door as required by referenced door standards.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 - 2. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- B. Occupancy Adjustment: Approximately six months after date of Final Acceptance, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

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

3.6 DOOR HARDWARE SETS

HINGES:	MCKINNEY	T4A3386	TA2714	T4A3786	TA2314
	HAGER	BB1199	BB1279	BB1168	BB1193
	HB IVES	5BB1HW	5BB1		
	STANLEY	RPFBB179			
EXIT DEVICES:	SARGENT	88 SERIES	US32D		
	VON DUPRIN	99 SERIES	US26D		
	CORBIN	ED5000 SERIES	US32D		
LOCKS:	BEST	45H 3H	US26D		
	SCHLAGE	9000 03A	US26D		
	YALE	8800FL	US26D		
CLOSERS:	SARGENT	281 SERIES			
	LCN	4010/4111 SERIES			
	CORBIN RUSSWIN	DC8200 SERIES			
OH STOPS	GLYNN JOHNSON:	900 SERIES	US32D		
		454 SERIES	US32D		
	ABH:	9020 SERIES	US32D		
		4400 SERIES	US32D		
	RIXSON:	10-006 SERIES	US32D		
		9-006 SERIES	US32D		

MANUFACTURER LIST

<u>Code</u>	<u>Name</u>
CR	Corbin Russwin
GL	Glynn Johnson
IV	Ives
LC	LCN Closers
LO	Schlage Electronics
MC	McKinney
ME01	Medeco High Security Locks
MGDF	MGDF
NA	National Guard
PE	Pemko
RO	Rockwood
SC	Schlage
ST	Stanley
VA01	Various
VO	Von Duprin

HARDWARE SETS

SET #01

3 Hinges	5BB1HW 4 1/2 x 4 1/2 NRP	630	IV
1 Lockset	L9453P 03A	626	SC
1 Closer	1461 H CUSH	AL	LC
1 KERFED FRAME	WITH SEALS	MGDF	
1 Lock Guard	LG10	US32D	IV
1 Raindrip	346 C 40"		PE
1 Door Bottom	345 A 36"		PE
1 Threshold	171 A 36"		PE

SET #02

3 Hinges	5BB1HW 4 1/2 x 4 1/2 NRP	630	IV
1 Lockset	L9070-03A	626	SC
1 Overhead Stop			
3 Door Silencers			

SET #03

3 Hinges	5BB1HW 4 1/2 x 4 1/2 NRP	630	IV
1 Lockset (privacy w/ indicator)	L9040-03A	626	SC
1 Door Bottom	345 A 36"		PE
1 Wall Bumper			
3 Door Silencers			

END OF SECTION 087100

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SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Doors.
- B. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames."

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, licensed in the State of North Carolina, using the following design criteria:
 - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Wind Design Data: As indicated on Drawings.
 - 2. Design Snow Loads: As indicated on Drawings.
 - 3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.

4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
 5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of glass product, other than clear monolithic vision glass, provide samples of the following products; 12 inches (300 mm) square.
 1. Fire-resistive glazing products.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, licensed in the State of North Carolina, responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers, manufacturers of insulating-glass units with sputter-coated, low-e coatings, glass testing agency, and sealant testing agency.
- B. Product Certificates: For glass and glazing products, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for , coated glass, and glazing sealants glazing gaskets.
 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.

- B. Installer Qualifications: A qualified experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Source Limitations for Glass: Obtain clear float glass and insulating glass from single source from single manufacturer for each glass type.
- F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- G. 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's "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 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 glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.10 WARRANTY

- A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Final Acceptance.

- B. Manufacturer's Special Warranty on Fire-Protection-Rated Glass: Manufacturer's standard form in which fire-protection-rated-glass manufacturer agrees to replace fire-protection-rated-glass units that deteriorate within specified warranty period. Deterioration of fire-protection-rated glass is defined as failure of surface-applied film to maintain peel adhesion without peeling, cracking, crazing, delaminating or discoloring under normal use that is not attributed to glass breakage or to maintaining and cleaning fire-protection-rated glass contrary to manufacturer's written instructions.
 - 1. Warranty Period: 3 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
 - 2. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as **Btu/sq. ft. x h x deg F (W/sq. m x K)**.
 - 3. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - 4. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - 2. For uncoated glass, comply with requirements for Condition A.
 - 3. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.3 GLAZING GASKETS

- A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

- B. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.4 GLAZING SEALANTS

- A. General:

1. Compatibility: Provide 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.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

2.5 GLAZING TAPES

- A. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

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.
- D. Spacers: Elastomeric blocks or continuous extrusions of 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. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.7 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

2.8 MONOLITHIC-GLASS TYPES

- A. Glass Type GL-1: Clear float glass; heat-strengthened float glass where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with system performance requirements. Provide fully tempered float glass where required or indicated.
 - 1. Thickness: 6.0 mm.
 - 2. Provide safety glazing labeling, where safety glazing is indicated or required.
 - 3. Location: At interior, non-fire-rated doors, sidelites, transoms, storefront and windows, unless otherwise noted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, 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 systems.
 - 3. Minimum required face and 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.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

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. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. 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 testing.
- 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)**.
 - 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. With glazing tape, use 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. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. 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.
- L. 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.
 - 1. Trim flush with stop after glazing installation is complete.
- 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 right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. 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.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to 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. Installation with Drive-in Wedge Gaskets: 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. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 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.

3.8 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. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing 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.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

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SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fixed, extruded-aluminum louvers, for glazing into curtainwall framing.
- B. Related Sections include the following:
 - 1. Division 01 Section "Sustainability Requirements" for low-emitting materials within the Building Interior and construction waste management.
 - 2. Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
 - 3. Division 07 Section "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.
 - 4. Division 08 Section "Glazed Aluminum Curtain Walls" for framing and custom sub-sill flashing under curtain-wall-framed louvers.
 - 5. Division 23 Sections for louvers that are a part of mechanical equipment.

1.3 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. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 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.
 - 1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
 - 2. Show mullion profiles and locations.
- C. Samples: For each type of metal finish required.

- D. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements, including analysis data signed and sealed by a qualified professional engineer licensed to practice in the State of North Carolina, responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. 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.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer licensed to practice in the State of North Carolina, using structural and seismic 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: Provide louvers, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.
 - a. Basic Wind Speed: 90 MPH
 - b. Exposure category: C
 - c. Importance Factor: 1.15.
 - 2. Seismic Loads: Design and detail louver and anchorage capable of withstanding and transferring seismic loads to the building structure. Seismic loads shall be calculated by the curtainwall designer per the North Carolina State Building Code based on the criteria indicated in the Contract documents.
- C. 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.

- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Wind-Driven-Rain-Resistant Louver, Glazed into Curtainwall:
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include the following:
 - a. Greenheck Dampers and Louvers 1” Curtain Wall Glazing Adapter Louver.
 - b. Ruskin Manufacturing Labor Savers 1” Flush Glazing Frame Louver.
 - c. Safe Air Dowco 1” Architectural Window / Curtain Wall Glazing Adapter Louver.
 - 2. Louver Depth: 4 inches.
 - 3. Frame, Blade and Adapter Nominal Thickness: Not less than 0.080 inch.
 - 4. Louver Performance Ratings:
 - a. Free Area: Not less than 50% of louver’s total face area.
 - b. Air Performance: Not more than 0.25-inch wg (60-Pa) static pressure drop at 1,300-fpm (6.6-m/s) free-area exhaust and intake velocity.
 - c. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 3 inches (75 mm) per hour and a wind speed of 29 mph (13 m/s) at a core-area intake velocity of 600 fpm (3.05 m/s).
 - 5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
 - 6. Frame: Glaze louver into curtain wall framing, as specified in Division 08 “Glazed Aluminum Curtainwall”.

2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
 - 1. Screen Location for Fixed Louvers: Interior face.
 - 2. Bird Screening: Flattened, expanded, ½” x ½” aluminum screen.
- B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
 - 1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
 - 2. Finish: Same finish as louver frames to which louver screens are attached.
 - 3. Type: Rewirable frames with a driven spline or insert.

2.5 BLANK-OFF PANELS

- A. Insulated, Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.
1. Thickness: 2 inches (50 mm).
 2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch (0.81-mm) nominal thickness.
 3. Metal Facing Sheets: Galvanized-steel sheet, not less than 0.028-inch (0.71-mm) nominal thickness.
 4. Metal Facing Sheets: Stainless-steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness.
 5. Insulating Core: Extruded-polystyrene foam.
 6. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch (2.03-mm) nominal thickness, with corners mitered and with same finish as panels.
 7. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
 8. Panel Finish: Black, two-coat fluoropolymer finish.
 9. Attach blank-off panels with stainless-steel sheet metal screws.
 10. Provide and install blank-off panels where louver area is not concealed by connected ductwork.

2.6 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), 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. For fastening aluminum, use 300 series stainless-steel fasteners.
- 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 according to ASTM E 488, conducted by a qualified independent testing agency.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
1. Paints and Coatings used in the Building Interior: VOC limit for each paint and coating product shall comply with requirements as listed in Division 01 "Sustainability Requirements".
 - a. Bituminous coatings: VOC of 350 g/L or less

2.7 FABRICATION

- A. Factory assemble louvers 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 where indicated.

- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate louver to be glazed into curtainwall framing, specified in Division 08 “Glazed Aluminum Curtain Wall”.
- E. Include supports, anchorages, and accessories required for complete assembly.

2.8 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Adapter finish to match louver.
- C. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- D. Champagne Anodic Finish: AAMA 612, AA-M10C21A44, Class I, 0.018 mm or thicker (0.7 mils minimum).

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

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.
- B. Install subsill flashing specified in Division 08 “Glazed Aluminum Curtain Walls”.

3.3 INSTALLATION

- A. Coordinate louver manufacturer requirements with curtainwall manufacturer requirements for glazing of louver into curtainwall framing.
- B. Install framed louver per requirements in Division 08 “Glazed Aluminum Curtain Walls”.
- C. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Protect louvers from damage during construction including the use of temporary protective covers where required and as allowed by louver manufacturer.

- B. Clean exposed louver surfaces 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 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.
- E. Final clean all louvers prior to final inspection with cleaning agents as recommended by the louver manufacturer.

END OF SECTION 089119

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size panels equal to 2 percent minimum of quantity installed.
 - a. Provide full, unopened boxes.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site 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.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: Class A according to ASTM E1264.
 2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS – ACT 1 – OFFICE AND STORAGE ROOM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling & Wall Solutions, Ultima 1912; or comparable product by, but not limited to, the following:
 1. CertainTeed Corporation.
 2. USG Corporation.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
 1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face.
 2. Pattern: E (lightly textured).
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.85.
- F. Ceiling Attenuation Class (CAC): Not less than 35.
- G. Noise Reduction Coefficient (NRC): Not less than 0.70.
- H. Edge/Joint Detail: Beveled, Tegular.

- I. Thickness: 3/4 inch.
- J. Modular Size: 24 by 24 inches.
- K. Provide 24 by 24 inch tile cut to fit where a strip of tile less than 3-inches in either direction would have to be used.
- L. Antimicrobial Treatment: Manufacturer's standard broad spectrum, 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 D3273, ASTM D3274, or ASTM G21 and evaluated according to ASTM D3274 or ASTM G21.

2.4 ACOUSTICAL PANELS – ACT 2 – TOILET ROOM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling & Wall Solutions, Ultima Healthzone 1937; or comparable product by, but not limited to, the following:
 - 1. CertainTeed Corporation.
 - 2. USG Corporation.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
 - 1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face.
 - 2. Pattern: E (lightly textured).
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.85.
- F. Ceiling Attenuation Class (CAC): Not less than 35.
- G. Noise Reduction Coefficient (NRC): Not less than 0.70.
- H. Edge/Joint Detail: Beveled, Tegular.
- I. Thickness: 3/4 inch.
- J. Modular Size: 24 by 24 inches.
- K. Provide 24 by 24 inch tile cut to fit where a strip of tile less than 3-inches in either direction would have to be used.
- L. Antimicrobial Treatment: Manufacturer's standard broad spectrum, 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 D3273, ASTM D3274, or ASTM G21 and evaluated according to ASTM D3274 or ASTM G21.

2.5 METAL SUSPENSION SYSTEM – FOR ACT-1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc., 9/16” Suprafine XL or comparable product by, but not limited to, the following:
 - 1. CertainTeed Corporation.
 - 2. USG Corporation.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.
 - 1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C635/C635M.
- C. Narrow-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, G30 (Z90) coating designation; with prefinished 9/16-inch- (15-mm-) wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. End Condition of Cross Runners: Override (stepped).
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Cold-rolled steel or aluminum.
 - 5. Cap Finish: Painted white.

2.6 METAL SUSPENSION SYSTEM – FOR ACT-2

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc., Prelude Plus XL Fire Guard 15/16”; or comparable product by, but not limited to, the following:
 - 1. CertainTeed Corporation.
 - 2. USG Corporation.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.
 - 1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C635/C635M.
- B. Wide-Face, Aluminum-Capped, Double-Web, Hot-Dip Galvanized, G60 (Z180), Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized, G60 (Z180) coating designation; with prefinished, 15/16-inch- (24-mm-) wide aluminum caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. Face Design: Flat, flush.
 - 3. Cap Finish: Painted white.

2.7 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.
- C. Hold-Down Clips: Manufacturer's standard hold-down.

2.8 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, provide products by, but not limited to, the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corporation.
 - 3. USG Corporation.
- B. 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. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 - 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- C. Curved Trim for ACT-1 Panels and Grid – Aluminum perimeter trim used as exposed decorative trim with suspended panels. Crisp-edge detailing and excellent corrosion resistance in custom fabricated assembly.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; Axiom Classic or comparable product by, but not limited to, the following:
 - a. CertainTeed Corp.
 - b. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - 2. Trim Height: As indicated on Drawings.
 - 3. Curve Radius: 6 feet.
 - 4. Color: White.

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.

- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. 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 unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C636/C636M, seismic design requirements, and manufacturer's written instructions.
- 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, counters playing, 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.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure 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. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 6. 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.
 - 7. Do not attach hangers to steel deck tabs.
 - 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 9. 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.
 - 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- 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. 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 precise fit.
 1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 3. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 5. Install hold-down seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
 - a. Hold-Down Clips: Space 24 inches o.c. on all cross runners.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 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.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

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SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Steel.
 - 2. Galvanized Metal.
- B. Related Requirements:
 - 1. Division 09 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

3. VOC content.

1.5 CLOSEOUT SUBMITTALS

- A. At project completion provide an itemized list complete with manufacturer, paint type, color coding, and location for all colors used of each type of coating for Owner's later use in maintenance.

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. The painting contractor shall receive written confirmation of the specific surface preparation procedures and primers used for all fabricated steel items from the fabricator / supplier to ascertain compatible finish coat materials to be used before painting any such work.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Paint: Furnish an additional 1 gal. (3.8 L) minimum of each material and color applied.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Materials' containers not bearing a label or bearing an illegible label will be considered as not complying with the specifications. Any coating already applied shall be removed from the surface to which applied.
- C. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.
- D. Waste Management And Disposal

1. Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Obtain information on these controls from applicable State and local government departments having jurisdiction.
2. All waste materials shall be separated and recycled. Collect waste paint by type and provide for delivery to recycling or collection facility. Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
3. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
4. Minimize the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground by adhering to the following procedures:
 - a. Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
 - b. Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - c. Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - d. Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - e. Empty paint cans are to be dry prior to disposal or recycling (where available).
 - f. Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.
5. Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

1.9 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between **50 and 95 deg F (10 and 35 deg C)**.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.

1.10 WARRANTY

- A. Furnish either the local MPI Accredited Quality Assurance Association's two year guarantee, or, alternatively, a 100% two year Maintenance Bond, both in accordance with MPI Painting Manual requirements. The Maintenance Bond shall warrant that all painting work has been performed in accordance with MPI Painting Manual requirements.

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. Benjamin Moore & Co.
 - 2. Duron, Inc.
 - 3. ICI Paints.
 - 4. Sherwin-Williams Company (The).
 - 5. Glidden Professional.

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
 - a. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
 - b. Clean existing surfaces of any materials that could affect adhesion of new coatings.
- D. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- F. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 4. Paint entire exposed surface of window frames and sashes.
 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

7. Paint colors, surface treatments, and finishes are indicated in the paint schedules and the Drawings.
 8. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 9. Provide finish coats that are compatible with primers used and with existing surfaces.
 10. Sand lightly between each succeeding enamel or clear coat.
 11. Prime existing surfaces that may not adhere to new coatings.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Apply additional coats of final coat if required to provide minimum coating thickness as specified. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer over metal surfaces that have been shop primed and touchup painted except as required in the paint schedule.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
 5. Apply successive coats within the time period recommended by the manufacturer to assure proper bonding.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. System E-1, Exterior High Performance coating: Galvanized steel.

1st coat:	Primer for galvanized metal:	Corothane I - Aliphatic Finish Coat MIO/Aluminum, B65S00014
2nd coat:	Urethane:	Corothane I - HS Moisture Cure Urethane Extra White/Tint Base, B65W00051
3rd coat:	Urethane:	Corothane I - HS Moisture Cure Urethane Extra White/Tint Base, B65W00051

- B. System E-2, Exterior High Performance coating: Non-galvanized steel.

1st coat:	Primer for non-galvanized steel:	Kem Kromik – Universal Metal Primer Off White
2nd coat:	Enamel:	Industrial Enamel Pure White, B54W00101
3rd coat:	Enamel:	Industrial Enamel Pure White, B54W00101

END OF SECTION 099113

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SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Steel.
- B. Related Requirements:
 - 1. Division 05 Section "Metal Fabrications" for shop priming of ferrous metal.
 - 2. Division 08 Section "Hollow Metal Steel Doors and Frames" for factory priming steel doors and frames.
 - 3. Division 09 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
 - 3. VOC content.

1.5 CLOSEOUT SUBMITTALS

- A. At project completion provide an itemized list complete with manufacturer, paint type, color coding, and location for all colors used of each type of coating for Owner's later use in maintenance.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: Furnish an additional 1 gal. (3.8 L) minimum of each material and color applied.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. Materials' containers not bearing a label or bearing an illegible label will be considered as not complying with the specifications. Any coating already applied shall be removed from the surface to which applied.
- C. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.
- D. Waste Management And Disposal

1. Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Obtain information on these controls from applicable State and local government departments having jurisdiction.
2. All waste materials shall be separated and recycled. Collect waste paint by type and provide for delivery to recycling or collection facility. Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
3. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
4. Minimize the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground by adhering to the following procedures:
 - a. Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
 - b. Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - c. Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - d. Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - e. Empty paint cans are to be dry prior to disposal or recycling (where available).
 - f. Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.
5. Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between **50 and 90 deg F (10 and 32 deg C)**.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.

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. Benjamin Moore & Co.
 2. Duron, Inc.
 3. ICI Paints.
 4. Sherwin-Williams Company (The).
 5. Glidden
 6. Dayton Superior

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
 - 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
 - 4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in occupied spaces:
 - a. Uninsulated metal piping.
 - b. Pipe hangers and supports.
 - c. Metal conduit, if not factory painted.

- d. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - e. Other items as directed by Architect.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Traffic Surfaces:
 - 1. Water-Based Clear Sealer System:
 - a. First Coat: Sealer, water based, for concrete floors, MPI #99.
 - b. Topcoat: Sealer, water based, for concrete floors, MPI #99.
- B. Steel Substrates:
 - 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer, rust-inhibitive, water based MPI #107.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
- C. Galvanized-Metal Substrates:
 - 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

END OF SECTION 099123

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:
 - 1. Exterior Substrates:
 - a. CMU.
 - b. Steel.
 - c. Galvanized-Metal.
- B. Related Requirements:
 - 1. Division 09 Section "Interior Painting" for general field painting.

1.3 DEFINITIONS

- A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Sustainable Design Submittals:
 - 1. Product Data: For paints and coatings, indicating VOC content.
- C. Samples for Initial Selection: For each type of topcoat product indicated.
- D. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.

- E. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Provide one gallon of each material and color applied.
 - 2. Provide paint color chart and paint color swatches for matching paint colors.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select two wall surfaces in Training Facility 300 for application of each coating system. Provide at least 100 sq. ft. mockup area at each location.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Exterior High-Performance Coating Schedule the coating category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
 - 3. Products shall be of same manufacturer for each coat in a coating system.
- C. VOC Content: For field applications within the Building Interior, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 50 g/L.
 - 3. Primers, Sealers, and Undercoaters: 100 g/L.
 - 4. Rust-Preventive Coatings: 100 g/L.
 - 5. Shellacs, Pigmented: 550 g/L.
 - 6. Shellacs, Clear: 730 g/L.
 - 7. Floor Coatings: 50 g/L.
 - 8. Pretreatment Wash Primers: 420 g/L.
 - 9. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
- D. Colors: As selected by Architect from manufacturer's full range.
 - 1. Refer to Drawing Sheets for Finishes Legend and Finishes Plans for anticipated color selections. The Interior Finishes Legend identifies Basis-of-Design products for the purpose of establishing colors, patterns and percentages of field and accent colors. The Basis-of-Design products do not preclude the use of products by other acceptable manufacturers provide all requirements and specification are met.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.

3. Masonry (Clay and CMUs): 12 percent.
 4. Wood: 15 percent.
 5. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
1. Clean surfaces with pressurized water. Use pressure with minimum 2100 psi pressure at 6 to 12 inches.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.
1. Clean surfaces with pressurized water. Use pressure with minimum 2100 psi pressure at 6 to 12 inches.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
1. SSPC-SP 6/NACE No. 3.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for coating and substrate indicated.
 - 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.5 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. CMU Substrates:
 - 1. Latex System:
 - a. Block Filler: Block filler, MPI #4.
 - b. Intermediate Coat: Latex, semi-gloss, MPI #11.
 - c. Topcoat: Latex, semi-gloss (MPI Gloss Level 5), MPI #11.
- B. Steel Substrates:
 - 1. Pigmented Polyurethane over Shop-Primed System:
 - a. First Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - b. Intermediate Coat: Polyurethane, two-component, pigmented, gloss matching topcoat.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

C. Galvanized-Metal Substrates:

1. Pigmented Polyurethane over Epoxy Primer System:

- a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
- b. Intermediate Coat: Polyurethane, two-component, pigmented, gloss matching topcoat.
- c. Topcoat: Polyurethane, two-component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

END OF SECTION 099600

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Public-use washroom accessories.
- 2. Hand dryers.
- 3. Underlavatory guards.

B. Related Requirements:

- 1. Division 06 Section “Rough Carpentry” for blocking.

1.3 DEFINITIONS

- A. FF&E Legend refers to the Furniture, Fixtures & Equipment Legend on Sheet A-0.1 of the Drawings.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
- 3. Include electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

- 1. Identify locations using room designations indicated.
- 2. Identify accessories using designations indicated.

1.6 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.8 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Structural Performance: Design accessories and fasteners to comply with the following requirements:
 - 1. Grab Bars: Installed units are able to resist 250 lbf (1112 N) concentrated load applied in any direction and at any point.
 - 2. Shower Seats: Installed units are able to resist 250 lbf (1112 N) applied in any direction and at any point.
- C. Accessibility Requirements: For operating mechanisms, comply with the DOJ's "2010 ADA Standards for Accessible Design," ICC A117.1-2009, and the 2018 North Carolina State Building Code Chapter 11 Accessibility.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain each type of public-use washroom accessory from single source from single manufacturer.

- B. Toilet Tissue Dispenser – Small - Item 1 in the FF&E Legend:
1. Basis-of-Design Product: Subject to compliance with requirements, provide American Specialties, Inc; ASI 0264-12 or comparable product by, but not limited to, the following:
 - a. Bobrick Washroom Equipment, Inc.
 - b. A&J Washroom Accessories.
 - c. Bradley Corporation.
 - d. Georgia-Pacific.
 2. Mounting: Surface-mounted.
 3. Toilet Tissue Dispenser Capacity: all standard core, up to 6" diameter tissue rolls.
 4. Toilet Tissue Dispenser Operation: Controlled delivery with no waste rocking action, theft resistant spindles with concealed release mechanism.
 - a. Spindle shall rotate 1/2 revolution for each operation and return to its original position.
 5. Material and Finish: Cast Aluminum with a satin matte silver-gray finish.
 - a. Spindle: impact resistant ABS thermoplastic.
- C. Automatic Paper Towel (Roll) Dispenser - Item 2 in the FF&E Legend:
1. Basis-of-Design Product: Subject to compliance with requirements, provide American Specialties, Inc.; ASI 68523AC or comparable product by, but not limited to, the following:
 - a. Bobrick Washroom Equipment, Inc
 - b. Bradley Corporation.
 2. Description: Automatic motion sensing mechanism with user-adjustable delay and paper towel length; electrically operated, with adapter for 110- to 240-V ac power supply.
 3. Mounting: Surface mounted.
 4. Minimum Capacity: 8-inch- (203-mm-) wide, 800-foot- (244-m-) long roll.
 5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 6. Lockset: Tumbler type.
- D. Automatic Wall-Mounted Soap Dispenser - Item 17 in the FF&E Legend:
1. Basis-of-Design Product: Subject to compliance with requirements, provide American Specialties, Inc.; ASI 20364 or comparable product by, but not limited to, the following:
 - a. Bobrick Washroom Equipment, Inc
 - b. Bradley Corporation.
 2. Description: Automatic dispenser with sensor to detect presence of hands; battery-powered; designed for dispensing soap in liquid or lotion form.
 3. Mounting: Surface-mounted.
 4. Capacity: 34 Fl Oz. Dispenser will continue to feed properly until empty.
 5. Materials: 18-8, type 304 stainless steel, No. 4 satin finish.
 6. Refill Indicator: Translucent removable tank. Internal shut-off valve to facilitate filling and external storage of full tanks.
 7. Lockable with key.
- E. Mirror Unit – Items 5 and 26 in the FF&E Legend:
1. Basis-of-Design Product: Subject to compliance with requirements, provide American Specialties, Inc; ASI 0600 or comparable product by, but not limited to, the following:
 - a. Bobrick Washroom Equipment, Inc.
 - b. Bradley Corporation.
 2. Frame: Stainless steel channel.
 - a. 18-8, type 304, 18gauge (.048 in. <1.2mm> thick) stainless steel. Unitized all welded construction. Corners mitered, welded and polished. Exposed surfaces shall have a No 4 satin finish. Edges and corners are burr free.

- b. Corners: Welded and ground smooth.
- 3. Glass: Standard glazing is No1 quality, 1/4" inch (6.4mm) thick plate/float, silver coated and hermetically sealed with a uniform coating of electrolytic copper plating, and warranted against silver spoilage for 15 years. Mirrors meet Federal Spec DD-M-411C, ASTM C-1503, and ASTM C-1036-91.
- 4. Filler: Expanded polyethylene microcell foam sheet material, abrasion resistant and shock absorbing, water resistant, 1/8" inch (3.2mm) total layer thickness.
- 5. Size:
 - a. Item 5 in the FF&E Legend: 18 inches wide x 36 inches high.
 - b. Item 26 in the FF&E Legend: 20" wide x 60 inches high.
- 6. Hangers: Manufacturer's standard rigid, tamper and theft resistant.

F. Grab Bar – Items 7, 8, 9 and 15 in FF&E Legend:

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide American Specialties, Inc; ASI Series 3800 or comparable product by, but not limited to, the following:
 - a. Bobrick Washroom Equipment, Inc.
 - b. Bradley Corporation.
- 2. Mounting: Flanges with concealed fasteners.
 - a. Snap-on Flange Covers for concealed mounting.
- 3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.
- 4. Outside Diameter: 1-1/2 inches.
- 5. Configuration and Length:
 - a. Item 7 in the FF&E Legend: Straight 18" long.
 - b. Item 8 in the FF&E Legend: Straight 36" long.
 - c. Item 9 in the FF&E Legend: Straight 42" long.
 - d. Item 15 in the FF&E Legend: L-Shaped 18" by 33".

2.3 HAND DRYERS

A. Source Limitations: Obtain hand dryers from single source from single manufacturer.

B. High-Speed Air Dryer – Item 16 in the FF&E Legend:

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide World Dryer Corporation; SLIMDri or comparable product by, but not limited to, the following:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
 - d. Excel Dryer Inc.
- 2. Description: High-speed, warm-air hand dryer for rapid hand drying.
- 3. Mounting: Surface mounted.
 - a. Protrusion Limit: Installed unit protrudes maximum 4 inches (102 mm) from wall surface.
- 4. Operation: Infrared-sensor activated with timed power cut-off switch.
 - a. Average Dry Time: 12 seconds.
 - b. Automatic Shut Off: At 60 seconds.
- 5. Maximum Sound Level: 75 dB.
- 6. Cover Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
- 7. Electrical Requirements: Maximum 120 V, 13 A, 1500 W.

2.4 UNDERLAVATORY GUARDS

- A. Underlavatory Guard Item 10 in the FF&E Legend:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Truebro by IPS Corporation; Lav Guard 2 Item #102 E-Z or comparable product by, but not limited to, the following:
 - a. Buckaroos, Inc.
 - b. Plumberex Specialty Products, Inc.
 2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
 3. Material and Finish: Antimicrobial, molded plastic, white.
 - a. Bacterial and fungus resistance: 0 growth, in accordance with ASTM G21 and G22.
 - b. Burning characteristics: Self-extinguished, in accordance with ASTM D-635.
 4. Color, Finish: Bright white, smooth.

2.5 MATERIALS

- A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, **0.031-inch**- minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.
- C. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), **0.036-inch**- minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A653/A653M, with **G60** hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.
- G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.6 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 - 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.
- C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 102800

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Portable, hand-carried fire extinguishers.
 - 2. Mounting brackets for fire extinguishers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-extinguisher cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-extinguisher cabinets to ensure fit and function.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.

- b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-extinguisher cabinet and mounting bracket 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. JL Industries, Inc., A division of Activar Construction Products Group
 - b. Kidde Fyrnetics.
 - c. Larsen's Manufacturing Company.
 - d. Potter Roemer LLC.
 2. Valves: Nickel-plated, polished-brass body.
 3. Handles and Levers: Manufacturer's standard.
 4. 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 (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel or stainless steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with chrome-plated or brushed stainless steel finish.
 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. JL Industries, Inc., A division of Activar Construction Products Group
 - b. Kidde Fyrnetics.
 - c. Larsen's Manufacturing Company.
 - d. Potter Roemer LLC.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
 - 1. Mounting Brackets: Install bracket at height such that extinguisher handle is at 48 inches maximum above finished floor.

END OF SECTION 104416

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SECTION 105300 – FACTORY-FINISHED ALUMINUM CANOPIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The extent and location of each type of canopy is shown on the Drawings. The type of canopy required includes the following:
 - 1. Wall-attached, overhead factory-finished extruded aluminum awning and wall bracket systems.
- B. Related sections include the following:
 - 1. Division 05 Section “Structural Steel Framing” for structural steel supports at awnings.
 - 2. Division 05 Section “Cold-Formed Metal Framing” for supporting awnings.
 - 3. Division 07 Section “Sheet Metal Flashing and Trim.”
 - 4. Division 07 Section “Joint Sealants” for joint sealants, joint fillers, and joint preparation.

1.3 SUBMITTALS

- A. Submit manufacturer’s product data indicating complete system description and load and span tables.
- B. Submit product data, shop drawings and structural calculations prior to commencing exterior wall construction.
- C. Shop drawings that include large-scale drawings of the extrusions for the fascia, beams, and gutters, indicating factory-welded connections and field-assembled connections. Provide typical sections and typical canopy elevations.
 - 1. Provide details of wall brackets and connections to walls including fasteners, anchor plates, framing and blocking.
- D. Paint color chart for initial color selection: Provide paint on printed color chart, with minimum of 32 standard and premium colors for Architect’s selection.
- E. Metal samples for final color selection: Provide six (6) 4-inch by 4-inch painted metal samples showing actual finish paint colors.
- F. Delegated-Design Submittal: For aluminum canopies to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, licensed in the State of North Carolina, responsible for their preparation. Aluminum canopy components shown in Drawings are based on preliminary calculations and aesthetics. Provide dimensions given in drawings to maintain aesthetic appearance. Extrusion thicknesses are to be as required to meet structural performance requirements, but must be at least as thick as stated in Part 2.

- G. Structural Calculations: Submit structural design calculations signed and sealed by a structural engineer licensed to practice in the state of North Carolina. Calculations to include all relevant data and calculations to indicate that the canopies will withstand all imposed loads as specified herein. Structural calculations to specify fasteners and anchors for attaching to adjacent construction. Provide calculations for each type of canopy and each typical connection condition.

1.4 QUALITY ASSURANCE

- A. Canopies shall be manufactured by a company that has been in business not less than five years and has a record of proven performance in the manufacturing of specified products on similar projects.
- B. Canopies shall be installed by the manufacturer or by a company that is trained and certified by the manufacturer for the installation of canopies.
- C. Provide all overhead supported canopy components from a single manufacturer.

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. Dittmer Architectural Aluminum.
 - 2. Peachtree Protective Covers.
 - 3. Mapes Canopies.

2.2 AWNINGS

- A. Supply extruded aluminum, factory-finished component materials meeting the following minimum criteria:
 - 1. Extruded Roof Deck thickness: 0.087"
 - 2. Extruded Beam wall thickness: 0.190"
 - 3. Extruded Gutter and Fascia wall thickness: 0.150"
 - 4. As required for structural spans shown in the Drawings.
- B. Sizes of extrusions to be as indicated in the Drawings or minimum size required fulfilling spans and loadings as indicated. All extrusions to be 6063-T6 alloy.
- C. Configuration: Construct the canopy of the size, height, profile, layout and configuration as indicated in the Documents. Deviations from the Documents will be acceptable only to withstand structural loading requirements as described herein. All deviations must be included in and submitted with product submittals as described above.
- D. Awnings are to be self-draining from deck into perimeter gutter frame to scuppers.
- E. Beams: Beams shall be open top where required for drainage, tubular extrusions of size and profile indicated in Drawings, top edges thickened for stiffening where required and designed to receive deck panels in self-flashing manner. Extruded structural ties shall be installed in tops of all beams.
 - 1. Gutter Beams/Gutters: Gutter beam / gutter sections to be extruded aluminum of sizes indicated.

- F. Fascia: Fascia shall be manufacturer's standard shape, height as indicated in the Documents. Fascia to be extruded aluminum, gauge as required for loading conditions.
 - 1. Provide extruded channel with matching finish fastened to top of Fascia Beam as indicated.
- G. Deck: Deck shall be self-flashing type, extruded aluminum sections interlocking into composite unit with sufficient camber to offset dead and live loading deflection to maintain positive drainage at all times and secured by screws.
 - 1. Roof deck to be flush bottom surface forming a tight seamed plane attached directly to the top of the beams, with no openings between deck panels and supporting beams. No gaps are allowed at the bottom surface of the deck.
 - 2. Roof Deck Ribs: 6" on center minimum, 2.5" deep minimum.
- H. Wall brackets shall be sized and detailed as indicated unless loading requirements dictate larger sized be used. Wall plates and brackets to be finished similar as canopy. Brackets are to match the aesthetics shown in the Drawings.
- I. Fasteners: All fasteners and anchors to be stainless steel, sized to support specified imposed loads.
 - 1. Deck: Provide at a minimum No. 14 by 1 inch, self-tapping, Type 18-8 stainless steel screws with neoprene washers, or as required by canopy engineer.
 - 2. Trim: Provide at a minimum No. 10 by 1/2 inch, self-tapping, Type 18-8 stainless steel screws, or as required by canopy engineer.
 - 3. Other fasteners: 18-8 stainless steel, type as required by canopy engineer.

2.3 STRUCTURAL DESIGN LOAD REQUIREMENTS

- A. Delegated Design: Engage a qualified professional licensed engineer, as defined in Division 01 Section "Quality Requirements," to design canopies.
- B. Canopies shall be designed withstand wind and other live loads as required by ASCE-7 at a minimum. Canopy panels shall further withstand normal loads imposed by maintenance activities including cleaning and routine maintenance.
- C. Structural calculations shall comply with the requirements of ANSI/ASCE 7 and the North Carolina State Building Code at a minimum unless more stringent requirements are specified. Structural calculations shall include anchors at walls and at footings/ slabs. See Design Criteria in the Structural Drawings for additional requirements.
 - 1. Wind Loads: Provide canopies, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.
 - 2. Seismic Loads: Design and detail canopy and anchorage capable of withstanding and transferring seismic loads to the building structure. Seismic loads shall be calculated by the canopy designer per the North Carolina State Building Code based on the criteria indicated in the Contract documents.

2.4 FINISH

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color and Gloss: As selected by Architect from manufacture's full range of 32 minimum standard and premium colors.

PART 3 - EXECUTION

3.1 COORDINATION

- A. The installer shall design the canopy system to support all design loads including wind, dead and live loads indicated. Reaction loads will be determined and verified with the Architect prior to canopy fabrication.
- B. Verification: General Contractor shall field verify all elevations, dimensions, abutting surfaces, and conditions prior to releasing canopies for fabrication.
- C. General Contractor shall coordinate through-wall flashing, anchorage, framing and blocking with canopy shop drawings prior to canopy fabrication.

3.2 FABRICATION

- A. Shop Assembly: Fabricate with corners mitered and heli-arc welded to the extent that completed pieces can be shipped on local, state and federal highways without special permit. Provide stainless steel bolted connections for elements that exceed shipping size.
- B. Grind welds smooth prior to finishing.

3.3 INSTALLATION

- A. Handle, store and transport canopy and canopy pieces in a manner that minimizes damage to components. Store away from work areas and protect as required to prevent damage.
- B. Install through-wall flashing, anchor plates, support structure and blocking prior to installation of canopy.
- C. General Contractor shall coordinate the Architect's observation of the through-wall flashing, concealed anchor plates, framing and blocking for the canopy prior to installation of the exterior sheathing.
- D. Seal all penetrations in air barrier system.
- E. Protect aluminum surfaces from direct contact with ferrous metal, grout, or other materials by applying one coat of clear acrylic coating to aluminum surface.

- F. Install canopy in a manner in accordance with the manufacturer's published installation instructions. The canopy deck to slope towards the gutter beams unless indicated otherwise in the Drawings.
- G. Provide all closure and trim sections required to provide a complete system. Intersection of canopy segments to be continuous and without gaps.
- H. Install all canopy components in a neat and clean fashion with tight joints.
- I. Repair any damaged finishes according to manufacturer's recommended practices for finish repair for finish specified. Replace all damaged components that are deemed unacceptable after repairs are made.
- J. Adjust and Clean: Touch up marred finishes, but replace materials that cannot be restored to factory-finish appearance. Use only materials and procedures recommended by the manufacturer.

END OF SECTION 105300

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SECTION 105613 - METAL STORAGE SHELVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Four-post metal storage shelving.
- B. Related Sections:
 - 1. Section 114000 "Foodservice Equipment" for metal shelving in kitchen, pantry, and refrigerated spaces.

1.3 DEFINITIONS

- A. FF&E Legend refers to the Furniture, Fixtures and Equipment Legend on Drawing Sheet A-0.01.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance for Four-Post Metal Storage Shelving: Capable of withstanding the loads indicated according to MH 28.1.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.
- B. Shop Drawings: For customized metal storage shelving. Include plans, elevations, sections, details, and attachments to other work. Include installation details of connectors, lateral bracing, and special bracing
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include installation details of connectors, lateral bracing, and special bracing.
- C. Samples for Initial Selection: For units with factory-applied color finishes. Include similar Samples of accessories involving color selection.
- D. Product Schedule: For metal storage shelving. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each type of metal storage shelving from manufacturer.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal storage shelving to include in maintenance manuals.

1.8 MATERIALS MAINTENANCE SUBMITTALS

- A. Furnish extra materials from same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Shelves: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than five shelves.
 - 2. Shelf-to-Post Connectors: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 10 connectors.
 - 3. Shelf-Label Holders: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 10 holders.

1.9 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 metal storage shelving from single source from single manufacturer.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install metal storage shelving 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.

1.11 COORDINATION

- A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling assemblies.
- B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating.
- D. Steel Tubing: ASTM A 513, Type 2.

- E. Stainless-Steel Tubing: ASTM A 554, Grade MT-304.
- F. Steel Wire: ASTM A 899.
- G. Floor Anchors: Galvanized-steel, post-installed expansion anchors power-actuated fasteners or threaded concrete screws. Provide number per unit recommended by manufacturer unless additional anchors are indicated in calculations.
- H. Wall Anchors: Manufacturer's standard, galvanized-steel anchors designed to secure metal storage shelving to adjacent wall. Provide one per shelving unit for each shelving unit adjacent to a wall unless additional anchors are indicated in calculations.

2.2 FOUR-POST METAL STORAGE SHELVING

- A. Open Four-Post Metal Storage Shelving - Item numbers 08 and 09 in the FF&E Legend: Factory-formed, field-assembled, freestanding system, designed for shelves to span between and be supported by corner posts, with shelves adjustable over the height of shelving unit. Fabricate initial shelving unit with a post at each corner. Fabricate additional shelving units similarly, so each unit is independent. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories 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. Adjustable Shelving Products; a division of Karp Associates, Inc.
 - b. Edsal.
 - c. Equipto.
 - d. Lyon Workspace Products, LLC.
 - e. Penco Products, Inc.
 - f. Schaefer Systems International, Inc.
 - g. Tennsco.
 - 2. Posts: Fabricated from hot-rolled steel; in manufacturer's standard shape; with perforations at 1 inch on center to receive shelf-to-post connectors.
 - a. Steel Thickness, Nominal: 0.075 inch minimum.
 - b. Post Base: Bolt leveler.
 - 3. Bracing: Manufacturer's standard, double diagonal cross bracing at back and ends; as required for stability, load-carrying capacity of shelves, and number of shelves.
 - 4. Solid-Type Shelves: Fabricated from steel sheet as follows:
 - a. Steel-Sheet Thickness, Nominal: 0.036 inch minimum.
 - b. Metallic-Coated Steel-Sheet Thickness, Nominal: 0.040 inch minimum.
 - c. Fabricate fronts and backs of shelves with box-formed edges, with corners lapped and welded.
 - 5. Shelf Quantity: Five shelves per shelving unit in addition to top and bottom shelf.
 - 6. Shelf-to-Post Connectors: Manufacturer's standard connectors.
 - 7. Base: Open, with exposed post legs.
 - 8. Accessories:

- a. Finished End Panels: Fabricated as perforated full-height panels from manufacturer's standard thickness cold-rolled steel sheet and with same finish as posts, with trim for a finished appearance along edges abutting posts and top shelf.
 - b. Shelf-Label Holders: Clear plastic, designed to clip onto front edge of shelf.
9. Finish: Baked enamel.
- a. Color and Gloss: As selected by Architect from manufacturer's full range.
10. Overall Unit Width: As specified in FFE legend.
11. Overall Unit Depth: As specified in FFE legend.
12. Overall Unit Height: 87 inches.

2.3 FABRICATION

- A. Shop Fabrication: Prefabricate shelving components in shop to greatest extent possible to minimize field fabrication; temporarily preassemble shelving components where necessary to ensure that field-assembled components fit together properly. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Fabricate metal storage shelving square and rigid, with posts plumb and true and shelves flat and free of dents or distortion. Fabricate connections to form a rigid structure, free of buckling and warping.
 - 1. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
 - 2. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 - 3. Build in straps, plates, brackets, and other reinforcements as needed to support shelf loading.
 - 4. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.
- C. Form edges and corners free of sharp edges or rough areas. Fold back and crimp exposed edges of unsupported sheet metal to form a 1/2-inch- (13-mm-) wide hem on the concealed side; ease edges of metal plate to radius of approximately 1/32 inch (0.8 mm). Shear and punch metals cleanly and accurately. Remove burrs.
- D. Weld corners and seams continuously to develop strength, minimize distortion, and maintain the corrosion resistance of base metals. At exposed locations, finish welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces before finishing.

2.4 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.

2.5 METALLIC-COATED STEEL-SHEET FINISHES

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over

it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A 780.

- B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry thickness.

2.6 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."
- B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry thickness.

PART 3 - EXECUTION

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. Examine floors for suitable conditions where metal storage shelving will be installed.
- C. Examine walls and ceilings to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum finished floor and wet mop resilient flooring over which metal storage shelving is to be installed.

3.3 INSTALLATION

- A. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.
 - 1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
 - 3. Adjust post-base bolt leveler to achieve level and plumb installation.
 - 4. Anchor shelving units to floor with floor anchors through floor plate. Shim floor plate to achieve level and plumb installation.
 - 5. Connect side-to-side and back-to-back shelving units together.
 - 6. Install shelves in each shelving unit at spacing indicated on Drawings or, if not indicated, at equal spacing.
 - a. Four-Post Metal Storage Shelving: Install four clips, one at each post, for support of each shelf; with clips fully engaged in post perforations.

B. Accessories:

1. Install finished end panels and trim at exposed ends of shelving units.
2. Shelf-Label Holders: Install one on each shelf, centered within each shelving unit.

3.4 ERECTION TOLERANCES

- A. Erect four-post metal storage shelving to a maximum tolerance from vertical of 1/2 inch (13 mm) in up to 10 feet (3 m) of height, not exceeding 1 inch (25 mm) for heights taller than 10 feet (3 m).

3.5 ADJUSTING

- A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.
- B. Adjust and lubricate operable components to operate smoothly and easily, without binding or warping. Check and readjust operating hardware.
- C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.
- D. Replace metal storage shelving that has been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 105613

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Horizontal louver blinds with aluminum slats.

- B. Related Requirements:

- 1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

1.3 ACTION SUBMITTALS

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

- B. Shop Drawings: For horizontal louver blinds, include fabrication and installation details.

- C. Samples for Initial Selection: For each type and color of horizontal louver blind.

- 1. Include Samples of accessories involving color selection.

- D. Samples for Verification: For each type and color of horizontal louver blind indicated.

- 1. Slat: Not less than 12 inches long.
 - 2. Tapes: Full width, not less than 6 inches long.
 - 3. Horizontal Louver Blind: Full-size unit, not less than 16 inches wide by 24 inches long.
 - 4. Valance: Full-size unit, not less than 12 inches wide.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For horizontal louver blinds with polymer slats that have been tested for compliance with NFPA 701, for tests performed by manufacturer and witnessed by a qualified testing agency .

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials , from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Horizontal Louver Blinds: Full-size units equal to 5 percent of quantity installed for each size, color, texture, pattern, and gloss indicated, but no fewer than two units.

1.7 QUALITY ASSURANCE

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet-work and 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 operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hunter Douglas Contract.

2. Levolor.
 3. Springs Window Fashions; SWFcontract.
- B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
1. Width: 2 inches .
 2. Thickness: Not less than 0.008 inch .
 3. Spacing: Manufacturer's standard .
 4. Finish: Ionized antistatic, dust-repellent, baked polyester finish .
- C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.
1. Capacity: One blind(s) per headrail unless otherwise indicated.
 2. Ends: Capped or plugged .
 3. Manual Lift Mechanism:
 - a. Lift-Cord Lock: Top locking; stops lift cord when blind is in fully opened or fully closed positions only; equipped with ring pull not more than 4 inches long.
 - b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.
 4. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
 - a. Tilt: Full.
 - b. Operator: Clear-plastic wand .
 - c. Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over rotation of gear.
 5. Manual Lift-Operator and Tilt-Operator Lengths: Full length of blind when blind is fully closed .
 6. Manual Lift-Operator and Tilt-Operator Locations: Manufacturer's standard unless otherwise indicated.
 7. Integrated Headrail/Valance: Curved face .
- D. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
1. Type: Bottom contoured to minimize light gaps .
- E. Lift Cords: Manufacturer's standard braided cord.
- F. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
1. Type: Braided cord .
- G. Valance: Two slats .
- H. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
1. Type: Overhead .

2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.

I. Colors, Textures, Patterns, and Gloss:

1. Slats: As selected by Architect from manufacturer's full range .
2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated .

2.3 HORIZONTAL LOUVER BLIND FABRICATION

- A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.
- C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
 1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. 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.

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 of the Work.

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

3.2 INSTALLATION

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
 - 2. Install mounting and intermediate brackets to prevent deflection of headrails.
 - 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.
- B. Electrical Connections: Connect motorized operators to building electrical system.

3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

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 ensures 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

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SECTION 133419 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Structural-steel framing.
2. Thermal insulation.
3. Accessories.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for concrete slab and foundations.
2. Division 04 Section "Unit Masonry" for masonry knee wall at metal building systems.
3. Division 07 Section "Standing-Seam Metal Roof Panel System" for metal roof panels at metal building systems.
4. Division 07 Section "Formed Metal Wall Panels" for metal wall panels at metal building systems.
5. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashing and trim at metal building systems.
6. Division 07 Section "Joint Sealants" for sealants and caulking.
7. Division 08 Section "Hollow Metal Doors and Frames" for hollow metal doors and frames in metal building systems.
8. Division 26 Section "Photovoltaic Power Systems" for roof mounted photovoltaic panels on the Training Facility roof.

1.3 DEFINITIONS

- A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in referenced standards.

1.4 COORDINATION

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.5 PREINSTALLATION MEETINGS

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

1. Review methods and procedures related to metal building systems including, but not limited to, the following:

- a. Condition of foundations and other preparatory work performed by other trades.
 - b. Structural load limitations.
 - c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Required tests, inspections, and certifications.
 - e. Unfavorable weather and forecasted weather conditions.
2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
 - b. Structural limitations of purlins and rafters during and after roofing.
 - c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
 - d. Temporary protection requirements for metal roof panel assembly during and after installation.
 - e. Roof observation and repair after metal roof panel installation.
3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
 - b. Structural limitations of girts and columns during and after wall panel installation.
 - c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 - d. Temporary protection requirements for metal wall panel assembly during and after installation.
 - e. Wall observation and repair after metal wall panel installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of metal building system component. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 1. Metal roof panels.
 2. Metal wall panels.
 3. Insulation and vapor-retarder facings.
 4. Flashing and trim.
 5. Accessories.
- B. Shop Drawings: Indicate components by others. Include plans, elevations, sections, details, attachments to other work, and the following:
 1. Anchor-Bolt Plans: Submit anchor-bolt plans and templates before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.

2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections. Coordinate with the Photovoltaic panel system to be installed on the Training Facility roof top.
 3. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
 - a. Show wall-mounted items including doors, windows, louvers, and lighting fixtures.
 - b. Coordinate with the Photovoltaic panel supplier for roof mounted photovoltaic panels
 4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:8):
 - a. Flashing and trim.
 5. Include details for and locations of connections, attachments and anchorages for insulation system.
- C. Samples for Initial Selection: For units with factory-applied color finish.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:
1. Metal Panels: Nominal 12 inches (300 mm) long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
 2. Flashing and Trim: Nominal 12 inches (300 mm) long. Include fasteners and other exposed accessories.
 3. Vapor-Retarder Facings: Nominal 6-inch-(150-mm) square Samples.
 4. Accessories: Nominal 12-inch-(300-mm-) long Samples for each type of accessory.
 5. Insulation: For each finish product specified, two samples, and minimum 6 inches square or long.
- E. Delegated-Design Submittal: For metal building systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, **licensed in the State of North Carolina**, responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified erector and manufacturer.
- B. Manufacturer Accreditation: Statement that metal building system and components were designed and produced by a manufacturer accredited according to the International Accreditation Service's AC472.
- C. Welding certificates.
- D. Metal Building System Certificates: For each type of metal building system, from manufacturer.

1. Letter of Design Certification: Signed and sealed by a qualified professional engineer licensed in the State of North Carolina: Include the following:
 - a. Name and location of Project.
 - b. Order number.
 - c. Name of manufacturer.
 - d. Name of Contractor.
 - e. Building dimensions including width, length, height, and roof slope.
 - f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 - g. Governing building code and year of edition.
 - h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, vertical deflection, complete wind and seismic design criteria including building lateral drift under wind and seismic loads.
 - i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
 - j. Risk Category: Indicate category of building use and its effect on load importance factors.
 - k. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.
 - E. Erector Certificates: For each product, from manufacturer.
 - F. Manufacturer Certificates: For each product, from manufacturer.
 - G. Material Test Reports: For each of the following products:
 1. Structural steel including chemical and physical properties.
 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 4. Shop primers.
 5. Non-shrink grout.
 - H. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for insulation and vapor-retarder facings. Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.
 - I. Warranties: Sample of special warranties.
- 1.8 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For metal panel finishes to include in maintenance manuals.
- 1.9 QUALITY ASSURANCE
- A. Manufacturer Qualifications: A qualified manufacturer and member of MBMA.
 1. Accreditation: According to the International Accreditation Service's AC472.

2. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.
 3. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.
- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- D. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.
- E. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Store insulation products in manufacturer's unopened packaging. Store insulation products indoors and protect from moisture and damage.

1.11 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements:
1. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.
 2. Established Dimensions for Metal Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.12 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal 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.
- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

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. American Buildings Company; a Nucor Company.
 - 2. Butler Manufacturing Company; a division of BlueScope Buildings North America, Inc.
 - 3. Ceco Building Systems; an NCI company.

2.2 METAL BUILDING SYSTEMS

- A. Description: Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.
 - 1. Provide metal building system of size and with bay spacings, roof slopes, and spans indicated.
- B. Primary-Frame Type:
 - 1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
 - a. See Structural Drawings for additional requirements, including reactions on building columns.
- C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns.
- D. Secondary-Frame Type: Manufacturer's standard purlins and joists and exterior-framed (bypass) girts.
- E. Eave Height: As indicated on Drawings.
- F. Bay Spacing: As indicated on Drawings.

- G. Roof Slope: As indicated on Drawings.
- H. Roof System: Provide metal roof panels as indicated in this specification section.
 - 1. Standing-Seam Metal Roof (SSMR) Panels on PEMB.
- I. Exterior Wall System: Provide metal wall panels as indicated in this specification section.
 - 1. Metal Wall Panels on PEMB.

2.3 METAL BUILDING SYSTEM PERFORMANCE

- A. Delegated Design: Design metal building system, including comprehensive engineering analysis by a qualified professional engineer, licensed in the State of North Carolina, using performance requirements and design criteria indicated.
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
 - 1. Design Loads: As indicated on Drawings.
 - 2. Deflection Limits: Design metal building system assemblies to withstand design loads with total load deflections no greater than the following:
 - a. Purlins and Rafters: Vertical live load deflection of 1/360 of the span. Total vertical live load plus dead load deflection of 1/240 of the span. Wind load deflection of 1/240 of the span under 10 year MRI wind loading.
 - b. Girts: Horizontal deflection of 1/240 of the span for girts supporting only metal wall panels, horizontal deflection of 1/400 of the span for 10 year MRI wind loading.
 - c. Metal Roof Panels: Vertical deflection of 1/240 of the span for total vertical live load plus dead load and 1/240 of the span for 10 year MRI wind loading.
 - d. Metal Wall Panels: Horizontal deflection of 1/240 of the span under 10 year MRI wind loading.
 - e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
 - 3. Drift Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:
 - a. Lateral Drift: Maximum of 1/400 of the building height under 10 year MRI wind loading.
 - 4. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.
- C. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7-10/2018 North Carolina State Building Code.
- D. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components,

failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. Air Infiltration for Metal Roof Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of roof area when tested according to ASTM E1680 at negative test-pressure difference of 1.57 lbf/sq. ft. (75 Pa).
- F. Air Infiltration for Metal Wall Panels: 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 E283 at static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).
- G. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E1646 at test-pressure difference 2.86 lbf/sq. ft. (137 Pa).
- H. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E331 at a wind-load design pressure of not less than 2.86 lbf/sq. ft. (137 Pa).
- I. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 1. Uplift Rating: UL 90.
- J. Thermal Performance: Provide insulated metal panel assemblies with the following maximum U-factors and minimum R-values for opaque elements when tested according to ASTM C1363 or ASTM C518:
 1. Storage Shed Metal Roof Panel Assemblies:
 - a. U-Factor: 0.037.
 - b. R-Value: R-19 + R-11 Liner System.
 2. Storage Shed Metal Wall Panel Assemblies:
 - a. U-Factor: 0.060.
 - b. R-Value: R-0 + R-15.8 Continuous Insulation.

2.4 STRUCTURAL-STEEL FRAMING

- A. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
 1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 - a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.
 2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
 3. Frame Configuration of:
 - a. Storage Building: Single gable.

4. Exterior Column Type: Tapered.
 5. Rafter Type: Tapered.
- B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.
- C. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from cold-formed, structural-steel sheet, shop primed for field painting, to comply with the following:
1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch-(64-mm) wide flanges.
 - a. Depth: As needed to comply with system performance requirements.
 2. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch-(64-mm) wide flanges.
 - a. Depth: As required to comply with system performance requirements.
 3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
 4. Flange Bracing: Minimum 2-by-2-by-1/8-inch (51-by-51-by-3-mm) structural-steel angles or 1-inch-(25-mm) diameter, cold-formed structural tubing to stiffen primary-frame flanges.
 5. Sag Bracing: Minimum 1-by-1-by-1/8-inch (25-by-25-by-3-mm) structural-steel angles.
 6. Base or Sill Angles: Minimum 3-by-2-inch (76-by-51-mm) zinc-coated (galvanized) steel sheet.
 7. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
 8. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from zinc-coated (galvanized) steel sheet.
 9. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
 10. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- D. Bolts: Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide zinc-plated or hot-dip galvanized bolts for structural-framing components that are galvanized.
- E. Materials:

1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade (50 or 55) 345 or 380; or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
 2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade (50 or 55) 345 or 380; or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
 3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade (50 or 55) 345 or 380; or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
 4. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55 (205 through 380), or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70 (310 through 480); or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80 (170 through 550), or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70 (310 through 480).
 5. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades (33 through 80) 230 through 550, or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80 (340 through 550); with G60 (Z180) coating designation; mill phosphatized.
 6. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades (33 through 80) 230 through 550, or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80 (340 through 550); with G90 (Z275) coating designation.
 - b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Structural Steel (SS), Grade (50 or 80) 340 or 550; with Class AZ50 (AZM150) coating.
 7. Non-High-Strength Bolts, Nuts, and Washers: ASTM A307, Grade A, carbon-steel, hex-head bolts; ASTM A563 (ASTM A563M) carbon-steel hex nuts; and ASTM F844 plain (flat) steel washers.
 - a. Finish: Plain.
 8. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - a. Finish: Plain.
 9. Headed Anchor Rods: ASTM F 1554, Grade 36.
 - a. Configuration: Straight.
 - b. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - c. Plate Washers: ASTM A 36/A 36M carbon steel.
 - d. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
 - e. Finish: Plain.
- F. Finish: Primary and secondary roof framing members to be factory-primed. Apply specified primer immediately after cleaning and pretreating.
1. Clean and prepare in accordance with SSPC-SP2.

2. Apply primer to primary and secondary roof framing to a minimum dry film thickness of 1 mil (0.025 mm).
 - a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil (0.013 mm) on each side.

2.5 METAL WALL PANELS

- A. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal major ribs and flat pan between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
 1. Material: Aluminum-zinc alloy-coated steel sheet, 0.022-inch (0.56-mm) nominal thickness.
 - a. Exterior Finish: Two-coat fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
 2. Major-Rib Spacing: 7 inches (178 mm) o.c.
 3. Panel Coverage: 36 inches (914 mm).
 4. Panel Height: 1.5 inches (38 mm).
 5. Basis-of-Design Product: Centria Style-Rib.
- B. Materials:
 1. 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.
 - a. 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.
 - b. Surface: Smooth, flat finish.
- C. Finishes:
 1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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.
 2. 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).

2.6 THERMAL INSULATION

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Simple Saver System by Thermal Design, Inc. or comparable product by, but not limited to, the following:
 1. Therm All.

- B. Unfaced Metal Building Insulation: ASTM C 991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch-(51-mm-)wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
 - 1. Thickness: Thickness required to meet thermal performance requirements specified elsewhere in this section.
 - 2. Width: Equal to purlin/girt spacing by manufacturer's standard lengths.
- C. Retainer Strips: 0.025-inch (0.64-mm) nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.
- D. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than 0.02 perm (1.15 ng/Pa x s x sq. m) when tested according to ASTM E 96/E 96M, Desiccant Method.
 - 1. Composition: White woven, reinforced, high-density polyethylene yarns coated on both sides with continuous polyethylene coatings.
 - a. Comply with ASTM C1136, Types I through VI.
 - b. Flame-spread index: 25 or less in accordance with ASTM E84.
 - c. Smoke-developed index: 50 or less in accordance with ASTM E84.
 - d. Ultraviolet radiation inhibitor to minimum UVMAX rating of 8.
 - e. Size and seaming: Fabricate to fit with minimum job site sealing.
 - f. Provide factory triple, extrusion welded seams.
 - g. Factory-folded.
- E. Vapor-Retarder Lap Sealant: Sealant of type recommended by vapor-retarder manufacturer.
- F. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- G. Vapor-Retarder Patch Tape: Tape of the same material as vapor-retarder facing and of type recommended by vapor-retarder manufacturer.
- H. Thermal Blocks: R-3.5 closed cell polyethylene foam with pre-applied adhesive film and peel off backing at girts. R-3.5 polystyrene thermal blocks at purlins.
- I. Straps: Galvanized, unpainted to match fabric liner color on the exposed side.
- J. Fasteners: Screws with sealing washers of type recommended by insulation system manufacturer.
- K. Wall Insulation Hangers: Preformed rigid hangers, 32 inch long galvanized steel strips with barbed arrows every 8 inches along length.

2.7 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
 - 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.

- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 2. Clips: Manufacturer's standard, formed from steel or stainless-steel sheet, designed to withstand negative-load requirements.
 3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel or stainless-steel sheet.
 4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 5. 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 roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch (25-mm) standoff; fabricated from extruded polystyrene.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, 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 material as metal wall panels.
 2. 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.
 3. Thermal Spacer Blocks: Specified elsewhere in this Section.
- D. Flashing and Trim: Formed from 0.022-inch (0.56-mm) nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.
1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
 2. Opening Trim: Formed from 0.034-inch (0.86-mm) nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- E. Materials:
1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.

- a. Fasteners for Metal Roof Panels: Self-drilling, Type 410 stainless-steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM washer under heads of fasteners bearing on weather side of metal panels.
 - b. Fasteners for Metal Wall Panels: Self-drilling, Type 410 stainless-steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head.
 - c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 - d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
 3. Metal Panel Sealants:
 - a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
 - b. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.8 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
 1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
 1. Make shop connections by welding or by using high-strength bolts.
 2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
 3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
 4. Weld clips to frames for attaching secondary framing.
 5. Shop Priming of Roof Members: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.

- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
 - 1. Make shop connections by welding or by using non-high-strength bolts.
 - 2. Shop Priming of Roof Members: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
 - 1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.9 STANDING SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.

- B. Integral-Standing-Seam Metal Roof Panels: Formed with integral ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and lapping and interconnecting side edges of adjacent panels.
 - 1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Preprimed by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 0.040 inch (1.02 mm).
 - b. Exterior Finish: Three-coat metallic fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range of no less than twenty metallic colors.
 - 2. Panel Coverage: 16 inches.
 - 3. Standing-Seam Height: 2 inches.
 - 4. Clips: Two-piece floating to accommodate thermal movement.
 - a. Material for Floating Top: 0.025-inch stainless steel sheet.
 - b. Material for Floating Base: 0.050-inch stainless steel sheet.
 - 5. Bearing Plate: 0.050-inch stainless steel sheet.
 - 6. Standing seam to include factory-installed, in-seam, elastomeric sealant.

- C. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, fascia, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves, valleys, and ridges, fabricated of same metal as metal panels.
 - 2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

3. Ridges, Valleys, Flashing and Trim: See Section 76200 "Sheet Metal Flashing and Trim" for additional requirements.
 - a. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - b. Nominal Thickness: 0.040 inch minimum.
 - c. Exterior Finish: Three-coat metallic fluoropolymer, to match roof panels.

2.12 AUXILIARY ROOF MATERIALS

- A. General: Auxiliary materials recommended by metal panel roofing manufacturer for intended use and compatible with roofing.
- B. Insulation Adhesive: Insulation manufacturer's recommended low-rise adhesive formulated to spot adhere roof insulation to substrate or to another insulation layer.
- C. Fasteners:
 1. All fasteners are to be series 300 stainless steel. Roofing nails shall be stainless steel, type 304 or 316. Provide #12 or #14, or as required by roof system manufacturer.
 2. Comply with requirements in Drawings and in Section 061000 "Rough Carpentry".
 3. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- D. Roof System Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are non-staining, and do not damage roof panel system finish.
 1. Joint Sealant: ASTM C 920; elastomeric silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panel system and remain weathertight; and as recommended in writing by metal roof panel system manufacturer.

2.13 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, 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 panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

2.14 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Metal Roof Panels and Accessories:
 1. Metallic Fluoropolymer: AAMA 621. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear top-

coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. 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).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
 1. Engage land surveyor to perform surveying.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.
- D. Verify metal building system is completed prior to installing insulation system.
- E. Proceed with insulation system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for bolt type and joint type specified.
 - a. Joint Type: Snug tightened or pretensioned.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 2. Locate and space wall girts to suit openings such as doors and windows.
 3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
1. Tighten rod and cable bracing to avoid sag.
 2. Locate end-bay bracing only where indicated.
- I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

- A. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
- B. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
 - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
 2. Install metal panels perpendicular to structural supports unless otherwise indicated.
 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.**
 5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment.
 6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
1. Install ridge caps as metal roof panel work proceeds.
 2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
1. Install clips to supports with self-drilling or self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.

5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Pre-drill panels for fasteners.
 6. Provide metal closures at peaks, rake edges, and rake walls each side of ridge caps.
- C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
 2. Shim or otherwise plumb substrates receiving metal wall panels.
 3. When two rows of metal panels are required, lap panels 4 inches (102 mm) minimum.
 4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
 5. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Pre-drill panels.
 6. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 7. Install screw fasteners in pre-drilled holes.
 8. Install flashing and trim as metal wall panel work proceeds.
 9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
 10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
 11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.
- C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), non-accumulative, on level, plumb, and on location lines as indicated, and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.7 THERMAL INSULATION INSTALLATION

- A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
1. Prepare surfaces using methods recommended by insulation manufacturer.
 2. Install insulation without gaps or voids. Do not compress insulation.
 3. Trim insulation to fit spaces, neatly. Insulate miscellaneous gaps and voids.
 4. Fit insulation tight in spaces and tight to exterior side of the sealed liner fabric and around mechanical and electrical services within plane of insulation.
 5. Completely seal all seams.
 6. Seal wall fabric to roof fabric, base angle and up columns to provide a continuous vapor retarder.
 7. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
 8. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
 9. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.
- B. Blanket Roof Insulation: Comply with the following installation method:
1. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
 - a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
 2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
- C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.
1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.8 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 roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- 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 (600 mm) of corner or intersection. Where lapped or bayonet-type 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).

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing agency to perform tests and inspections.
- B. Tests and Inspections:
1. High-Strength, Field-Bolted Connections: Connections shall be tested and inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- C. Product will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.9 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- C. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
 - 1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- D. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. Clean dirt or exposed sealant from the exposed vapor retarder fabric.
- F. Protect insulation system until interior finishes installation is complete. Repair or replace damaged products before completion of insulation system installation.

END OF SECTION 133419

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SECTION 220000 – PLUMBING REQUIREMENTS

A. GENERAL

1. GENERAL CONDITIONS

- a. Drawings, all Contract Documents, and Division-1 Specifications sections, apply to work of this Section.
- b. Where the term "Contractor" is used it shall mean the Plumbing Contractor.
- c. Contractors bidding on this section are notified that they shall hold a license for Plumbing as issued by the North Carolina State Board of Examiners of Plumbing and Heating Contractors.
- d. Reference shall be made to the Architectural, Structural, Heating and Air-conditioning, and Electrical drawings and specifications for details of building construction and for coordination with other parts of construction.
- e. Contractor shall visit the job site before the submission of a bid and familiarize himself with existing conditions. Submission of a bid will be considered as evidence that the Contractor has visited the site and is familiar with existing conditions.

2. BIDDING

- a. See General conditions.

3. SCOPE OF THE WORK

- a. The work to be done under this contract consists of furnishing all labor, materials, equipment, devices, appliances, tools, transportation, and services as required, and in performing all functions to completion and leave ready for operation the installation of the plumbing work in strict accordance with these specifications and applicable drawings and subject to the terms and conditions of the contract.
- b. Obtain all permits and make all test.

4. INTENT

- a. It is the intention of the specifications and drawings to call for finished work, tested, and ready for operation. Work shall be installed in accordance with the drawings and specifications using skilled workmen.
- b. It shall be the responsibility of this Contractor upon discovering any discrepancies in the drawings or specifications or points of conflict therein, to immediately notify the Owner who will clarify such discrepancies or conflicts in writing before the work progresses beyond said point. No extras will be allowed because of failure to properly notify the Owner.

5. CODE, PERMITS AND INSPECTIONS

- a. All work under this specification shall comply with all local and state codes, laws, ordinances and regulations. Wherever the drawings and specifications are in excess of such laws, ordinances and regulations, the drawings and specifications shall hold.
- b. Contractor shall obtain permits and arrange all inspections necessary for the installation of this work, paying all fees in connection therewith, and furnishing the Owner with certificates of inspection from all authorities having jurisdiction.
- c. No piping or other construction shall be covered up or concealed until it has been inspected, tested and approved. The Contractor shall furnish all labor, materials, water, fuel, equipment, and apparatus and bear all expenses of such tests as are hereinafter specified for the work under this section of the specifications.

6. DRAWINGS AND SPECIFICATIONS

- a. The plumbing drawings show the general arrangement of all piping, equipment and appurtenances and shall be followed as closely as actual building construction will permit.
- b. Plumbing work shall conform to the requirements shown on all the drawings. Architectural and Structural drawings shall take precedence over Plumbing drawings. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings, valves and accessories as may be required to meet such conditions.
- c. The drawings and specifications are complementary each to the other and what is called for by one shall be as binding as if called for by both.
- d. Omission of particular reference to any item necessary for a complete installation and proper operation thereof, shall not relieve the Contractor of the responsibility of furnishing same.

7. COORDINATION OF WORK

- a. The Contractor shall coordinate the work with other contractors on the project. All work shall be so arranged that there will be no delay in the proper installation and completion of any part or parts of all piping systems and equipment. Work shall be installed in proper sequence with other trades, and without unnecessary delays.
- b. The layout shown shall be followed as closely as circumstances will permit but the Contractor must lay out his work so as not to conflict with other trades and to avoid

any unnecessary cutting of or damage to walls, floors or other parts of his equipment.

- c. Whenever interferences might occur, before installing any of the work in question, the Contractor shall consult with other contractors and shall come to an agreement with them as to the exact location and level of his piping and other parts of his equipment.
- d. Locations of pipes, equipment, and appurtenances shall be adjusted to accommodate the work to interferences anticipated and encountered. The Contractor shall determine the exact route and location of each pipe prior to fabrication. Lines, which pitch, shall have right of way over those which do not pitch. Lines whose elevations cannot be changed shall have right of way over lines whose elevations can be changed.
- e. Offsets and changes in direction in pipes shall be made as required to maintain proper head room and pitch of sloping lines whether or not indicated on the drawings. The Contractor shall furnish and install all accessories as required to effect these offsets and changes in direction.

8. EQUIPMENT AND MATERIALS

- a. Catalog numbers and trade names in these specifications and noted on the drawings are intended to describe the material, devices or apparatus wanted. Similar materials, devices or apparatus of other manufacturers, if of equal quality, capacity and character, may be substituted on the written approval of the Owner. If the Contractor fails to comply with the provisions of this paragraph, he shall be required to furnish all materials and equipment as specified.
- b. All materials shall be new and bear the manufacturer's name, trade name and the UL Label in every case where a standard has been established for the particular material. The equipment to be furnished shall be essentially the standard product of a manufacturer regularly engaged in the production of the required type of equipment, and shall be the manufacturer's latest approved design.
- c. Equipment and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection until installed.
- d. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.
- e. Equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury and theft. Damage or defects developing before acceptance of the work shall be made good at the Contractor's expense.

- f. Dimensions: It shall be the responsibility of the Contractor to insure that items to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections, and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the drawings and specifications.

9. EQUIPMENT ACCESSORIES

- a. The Contractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work, ready for use, occupancy and operation by the Owner.
- b. Supports: The Contractor shall support plumb, rigid and true to line all work and equipment furnished under this section. The Contractor shall study thoroughly all general, structural, mechanical and electrical drawings, shop drawings, and catalog data to determine how equipment, fixtures, piping, etc., are to be supported, mounted or suspended and shall provide extra steel bolts, inserts, pipe stands, brackets and accessories for proper support whether or not shown on the drawings.

10. CUTTING, PATCHING, AND REPAIRING

- a. In new construction, the General Contractor will provide all openings in wall, floor, and roof construction required by the Plumbing Contractor for installation of his work, provided complete information is furnished to the General Contractor at the time required. Failure to provide necessary information will necessitate provisions of additional required openings, chases, recesses, etc., by Plumbing Contractor at his own expense, and he shall be fully responsible for the proper cutting and patching of such construction as approved and directed by the Owner.
- b. Where pipes or conduit pass through walls, floors, or roofs, sleeves shall be furnished by this Contractor and installed, except as noted otherwise, by the trade furnishing and installing the material in which they are located. Location of sleeves, inserts, and supports shall be as directed by this Contractor who will also insure that they are properly installed. Sleeves shall be neatly sawed, sheared, or cut with wheeled cutters. No flame cutting will be permitted.
- c. Each trade shall bear the expense of all cutting, patching, repairing or replacing of the work of other trades required because of his fault, error or tardiness or because of any damage done by him.
- d. Under no circumstances shall the Contractor cut any structural beam or support without prior approval and instructions from the Owner.
- e. If Plumbing Contractor installs Plumbing work through exposed finish walls, ceiling or floor after they are in place, the Plumbing Contractor shall close excess openings around his work to match finish surface.

11. SHOP DRAWINGS AND SUBMITTAL DATA

- a. The Contractor shall submit to the Owner after the award of the contract, a folder containing catalog cuts and descriptions giving name of manufacturer, trade name, type, catalog number and location in work, of all equipment which he proposes to use in the execution of the contract.
- b. Approval is solely for the purpose of determining suitability and will in no way absolve the Contractor of his responsibility for the correctness of measurements, quantities, or performance. Approval of shop drawings shall not constitute a change in the contract requirements.
- c. Shop drawings must comply with the requirements of all regulatory bodies having jurisdiction.
- d. Contractor shall furnish at least five (5) copies of submittal data. Three (3) copies will be returned to the Contractor. If the Contractor desires the return of more than three (3) copies, additional copies shall be furnished at the time of original submission.

12. WORKMANSHIP

- a. The work throughout shall be executed in the best and most thorough manner, under the periodic observation of and to the satisfaction of the Owner and Engineer who will jointly interpret the meaning of the drawings and specification, and shall have the power to reject any work or materials which, in their judgment, are not in full accordance therewith.

13. SINGULAR

- a. In all cases where a device or piece of equipment is referred to herein or on the drawings in the singular number, it is intended that such reference shall apply to as many such devices as are required to complete the installation.

14. USE OF THE WORD “PROVIDE”

- a. Herein, where the word "Provide" is written in these specifications, provide shall be understood to mean provide complete in place, that is, "Furnish and Install".

15. SUPERVISION AND SUPERINTENDENCE

- a. The Contractor shall, during the progress of the work, maintain a competent superintendent, who shall not be change d except if he proves unsatisfactory to the Contractor or the Owner. Efficient supervision shall be given to all work under this contract.

B. PRODUCTS

1. EXCAVATION, TRENCHING, AND BACKFILL

- a. Unless noted otherwise on the drawings, the Plumbing Contractor shall do all excavation and backfill required for his work. Unless otherwise shown, provide separate trenches for each sanitary sewer, storm sewer, and water line. Lay all pipe in open trenches except when the Owner gives written permission for tunneling.
- b. **Sheeting, Bracing, and Water Removal:** Sheet and brace trenches, and remove water as necessary to fully protect workmen and adjacent structures and permit proper installation of the work. Comply with all local regulations or, in the absence thereof, with the provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc. Under no circumstances lay pipe or install appurtenances in water. The trench shall be kept free from water until pipe joint material has hardened. The presence of ground water in the soil or the necessity of sheeting or bracing trenches shall not constitute a condition for which any increase may be made in the contract price. Sheeting shall not be removed until the trench is substantially backfilled.
- c. **Rock Excavation:** The material to be excavated is assumed to be earth and debris encountered in the project area. If rock should be encountered, an agreed extra compensation will be allowed. Earth shall include all material that can be removed by a 3/4-yard power shovel. Rock is defined as rock, stone, hard shale in original ledge, boulders, masonry and rock fragments over nine (9) cubic feet in volume, and cannot be removed by power shovel or without the use of explosives or drills.
- d. **Blasting:** The written consent and approval of method from the Owner must be obtained before explosives are used, and if used, all local regulations, laws, and ordinances shall be observed. Cover blasts with heavy timbers or mats and set off no blast within twenty-five (25) feet of pipe already laid in the trench. Protect pipe already laid with earth backfill.
- e. **Grading Trench Bottoms:** Grade the bottom of trenches evenly to insure uniform bearing for the full length of all pipes. Cut holes as necessary for joints and joint making. Excavate all rock, cemented gravel, or other hard materials to at least four (4) inches below the pipe at all points. Refill to grade with sand or fine gravel firmly compacted.
- f. **Backfill trenches only after piping has been inspected, tested and locations of pipe and appurtenances have been recorded.** Backfill by hand around pipe and for a depth of one (1) foot above the pipe using earth without rock fragments or large stones, and tamp firmly in layers not exceeding six (6) inches in thickness, taking care not to disturb the pipe or injure the pipe coating. Compact the remainder of the backfill thoroughly with a rammer of suitable weight or with an approved mechanical tamper, in layers not exceeding six (6) inches in thickness. All cinders and rubbish shall be prohibited from all trenches.

All fill within the building shall be compacted to 95 per cent of the maximum standard Proctor density.

2. SANITARY, WASTE, AND VENT LINES

- a. The following lines and fittings shall be Schedule 40 PVC:

Underfloor and underground waste lines

- b. The following lines and fittings shall be Schedule 40 PVC:

Above floor sanitary waste lines

Above floor vent lines

- c. Installation:

- i. Piping of sizes shown shall be run as indicated on the drawings. All extensions above the roof shall be made according to code and as detailed on the drawings. Soil waste and vent stacks shall be run in partitions and suspended above ceilings where indicated. Vertical vent pipes shall be connected together into one main vent stack or riser above the fixtures and vented as indicated on riser diagrams. Vents and branch vent lines shall be free from drops or sags and be graded and connected so as to drip back into the soil or waste pipe by gravity. Where vent pipes connect to the horizontal soil or waste pipe, the vent branch shall be taken off above the center line of the pipe and the vent pipe extended vertically or at an angle of forty-five (45) degrees to the vertical before off-setting or connecting to branch, main waste or soil vent.
- ii. Vents from any fixture or line of fixtures, when connected to a vent line serving other fixtures, shall be extended at least six (6) inches above the flood level rim of the highest of such fixtures to prevent use of the vent line as a waste. Extensions of vent pipes through a roof shall be terminated not less than twelve (12) inches above the roof.
- iii. Horizontal drainage piping shall be installed in practical alignment at the grade shown on the drawings, but in no case less than a uniform grade of 1/8 inch per foot for sizes 3" and larger. For sizes 2" and smaller grade shall be not less than 1/4 inch per foot.
- iv. Changes in direction in drainage piping shall be made by the appropriate use of forty-five (45) degrees wyes, half-wyes, or long sweep quarter, sixth, eighth, or sixteenth bends. Sanitary tees or short quarter bends may be used when two (2) fixtures are installed back to back and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. No change in direction of flow greater than ninety (90) degrees shall be made. Where

different sizes of drainage pipes or pipes and fittings are to be connected, standard increasers and reducers of proper size shall be used. Reduction of the size of drainage piping in the direction of flow is prohibited.

- v. Drilling and tapping of house drains, soil, waste or vent pipes, and the use of saddle hubs and bands are prohibited.
- vi. Cross-connections or any fixtures, devices, or construction which will permit backflow connections between a water distribution system and any part of the drainage system shall not be installed.
- vii. All piping shall be made permanently gas and water tight. Any fitting or connection which has an enlargement, chamber, or recess with a ledge or shoulder or reduction of the pipe area that offers an obstruction to flow through the pipe shall not be installed. Threaded joints shall be made with a lubricant on the male thread only. All burrs or cutting shall be removed and pipe shall be reamed or filed out to not less than the original diameter.
- viii. Floor connections for water closets and other fixtures shall be made by means of an approved brass, or iron flange, caulked, into the drainage pipe. The connection shall be bolted, with an approved gasket or approved setting compound between the fixture base and the connections.

3. WATER PIPING, COLD AND HOT

- a. Copper tubing, water, ASTM Specification B-88-55, Type K and Type L.
- b. Soldered joint fittings, wrought type, American Standard Specification B-16 22-1951. Fittings to be of same manufacturer as copper tubing.
- c. Silver Solder: 15% silver, 80% copper, 5% phosphorous conforming to ASTM B 260-52T.
- d. 95/5 Solder: 95% tin, 5% antimony.
- e. Above-ground Piping: Seamless, type L, hard drawn copper with wrought copper fittings.
- f. Underground Piping: Piping shall be seamless, type K, soft copper with wrought copper fittings.
- g. Valves: Valves shall have the name and trademark of the manufacturer and the guaranteed working pressure cast on the body of the valve. All valves shall be of one manufacturer and identified by manufacturer's catalog number stamped on a metal disk located under the valve handle nut. Valves shall be bronze NIBCO S-111 or approved equal.
- h. Installation:

- i. All piping shall be provided with identification in accordance with ANDI A13.1-1981 standards. Markers shall be located at each wall, floor, and ceiling penetration, and at every 20ft. Markers shall be fully legible from floor level showing medium contained in pipe, and direction of flow.
- ii. Contractor shall provide hot and cold water mains with branches and risers complete from point indicated on plans running to all fixtures and other outlets indicated. Mains and branches shall be run generally as shown on the drawings. Contractor shall provide all interior water piping, branches, and risers as shown on the drawing and shall make connections to all plumbing fixtures, hose bibbs, wall hydrants, and other points requiring water under this and other divisions of the specifications.
- iii. All water mains and branches shall be pitched at least one (1) inch in twenty-five (25) feet toward fixtures. The piping installation shall be arranged so that the entire system can be drained through fixture supply connections. Unions shall be installed at the connections to each piece of equipment to allow removal of equipment without dismantling connecting piping.
- iv. Size of all water piping shall be as shown on the drawings. Sizes for connections to fixtures and equipment shall be not less than shown in the schedules on the drawings.
- v. Plumbing Contractor shall be held responsible for any damage to any work installed by others caused by leaks or improper installation of the piping system. The Contractor shall coordinate his work with that of the Heating Contractor and where interference occurs, shall procure approval from the Owner before installation of the work.
- vi. Provide eighteen (18) inch high air chambers at fixtures with flush valves. At other fixtures air chambers shall be eighteen (18) inches high. Pipe size for air chambers shall be same as supply to fixture.
- vii. Soldered or Bronzed Joints: Joints 1-1/4 inches and larger shall be made with silver solder. For joints less than 1-1/4 inches and all valves (regardless of size) use 95/5 solder. Also use a non-corrosive paste flux in accordance with manufacturer's instructions. All joints shall be thoroughly cleaned with emory cloth and reamed cut before assembly. Acid core solder will not be permitted.
- viii. Pipe penetrations through floor slabs and fire rated walls shall be restored to the slab or fire rated wall's original rating and shall be sealed with impervious non-combustible materials sufficiently tight to prevent transfer of smoke or combustion gases from one side of the wall or slab to the other in accordance with UL methods.

- ix. As appropriate to the penetration size and location, provide firestopping using one of the following:
- x. High-temperature non-shrink grout shall be installed in accordance with recommendations of ACI, CSI and the manufacturer's specifications.
- xi. Fill openings with Thermafiber Safing insulation.
- xii. Caulk full depth of wall or floor with 3M fire barrier; material - No. 25 caulk or 303 putty.
- xiii. Penetrations through existing construction shall be neatly drilled or cut, and the opening completely filled around the penetrating pipe with the approved firestopping material. Solid masonry and concrete walls as well as concrete slabs shall be core drilled. Diameter of core drilled holes shall be from 3/4 inch to 1-1/2 inch bigger than the outside diameter of pipe. Pipe shall be secured within 18 inches of the penetration, both sides, from other than the fire wall or slab itself.

4. OPEN ENDS

- a. This Contractor shall keep all ends of piping including those extending above the roof, drains, and fixture branches closed with caps or plugs so as to prevent dirt from building materials from getting into pipes and traps during construction.

5. HANGERS, ANCHORS, AND GUIDES

- a. All piping in building shall be rigidly supported from the building structure by means of approved hangers and supports. Piping shall be supported to maintain required grading and pitching of lines, to prevent vibration, and to secure piping in place and shall be so arranged as to provide for expansion and contraction.
- b. Generally, pipe hangers shall be attached to 1-1/2" x 1- 1/2" x 1/4" angles supported between joists or supported from clamps attached to bar joists. Use trapeze hangers, 1-1/2" x 1-1/2" x 1/4" angles, where possible and lines can be grouped. Trapeze hanger to be supported from joists by beam clamps.
- c. Spacing of hangers shall not be greater than the following:
 - i. Horizontal soil pipe, 5'-0" on centers.
 - ii. Copper tubing, 2" size, 10'-0" on centers,
1-1/2" and smaller 6'-0" on centers.
 - iii. In addition, provide two (2) hangers at each turn in horizontal line approximately two (2) feet from fitting.
- d. Hangers shall be adjustable steel clevis, MSS Type 1. Select size of hangers to exactly fit pipe size for bare piping and to exactly fit around piping insulation with

saddle of shield for insulated piping. Provide copper plated hangers and supports for copper piping that do not receive insulation.

- e. Hanger rods shall not be less than the following sizes and machine threads:

2" and smaller	3/8" diameter
2-1/2" and 3"	1/2" diameter
3-1/2", 4" and 5"	5/8" diameter

- f. Provide fastening devices, turnbuckles or other leveling devices, locknuts, rods and inserts as required to properly support the piping systems.

6. PIPE INSULATION

- a. All hot and cold water piping in building shall be insulated.
- b. Piping shall be insulated with premoulded glass fiber. Jacket shall be factory applied white kraft bonded to aluminum foil, reinforced with fiberglass yarn. Insulation shall be Johns-Manville Flame-Safe with VB jacket or equal by Owens Corning or Certainteed - 1" thick for all piping and all pipe sizes.
- c. Provide 4" sealing strips of jacket for butt joints. Securely fasten jacket at longitudinal laps and sealing strips with adhesive and flare-door type staples 3 to 4 inches on centers. Each staple shall be sealed after installation with adhesive. Adhesive shall be Foster Spark-FAS 85-20. Apply according to manufacturer's recommendations.
- d. At hanger locations, the Contractor shall furnish and install insulation protection saddle between insulation and hanger. Insulation shall pass through hanger unbroken.
- e. All fittings, valve bodies, etc., to be insulated with machined fiberglass fitting covers and PVC ZIP jackets as manufactured by Speed Line Manufacturing Company. Install according to manufacturer's recommendations.
- f. Insulation shall pass through all sleeves and walls unbroken.
- g. All insulation material shall have 25/50 smoke and flame rating.

7. PLUMBING FIXTURES

- a. The best quality of plumbing fixtures and trimmings shall be provided, fabricated by a manufacturer of established reputation, and all plumbing fixtures shall be of same manufacturer through entire job.
- b. All fixtures shall have the manufacturer's guarantee label or trademark indicating first quality. All enameled ware shall bear the manufacturer's symbol signifying acid resisting enamel.

- c. Quantities: The Contractor is referred to the Architectural and Plumbing drawings for the quantities of fixtures to be furnished under this division of the specifications which shall be deemed to include all plumbing fixtures shown of the type described hereinafter, complete with all necessary trimmings.
- d. All supply fittings to lavatories, urinals, and water closets through wall to valve and to fixture shall be chrome plated brass, complete with chrome plated escutcheon.
- e. The fixtures herein, specifying catalog numbers, show the type and quality of plumbing fixture desired in each instance. Owner approved equal fixtures of the following manufacturers will be acceptable.

Fixtures	American-Standard, Kohler, Eljer, Elkay, Just
Trim	As for fixtures plus Chicago Faucet, Sloan, Delta, Symmons, McGuire
Seats	Church, Beneke, Olsonite
Carriers	Josam, Wade, Zurn
Floor Drains	Josam, Wade, Zurn
Cleanouts	As for floor drains
Water Cooler	Halsey Taylor, Elkay, Sunroc
Water Heater	Rudd, State, A.O. Smith

- f. All fixtures shall be white
- g. Refer to drawings for fixture schedule.

C. EXECUTION

1. ELECTRICAL CONNECTIONS OF EQUIPMENT

- a. Wiring from disconnect switches, junction boxes, panel board circuit breakers, etc. up to mechanical equipment shall be by the electrical contractor. Final electrical connections to plumbing equipment shall be by this contractor.
- b. Control wiring and control connections for plumbing systems is by this Contractor.

2. PROTECTION DURING CONSTRUCTION

- a. Plumbing fixtures and trim shall be protected against damage or injury due to building materials, acid, tools, equipment, or any causes incidental to construction.

- b. The finished surface of each fixture shall be covered with building paper or similar protection. All fixtures damaged by any cause, and any trim with marred or scratched finish shall be replaced at nocost to the Owner. The fixture and fixture trim protection shall be removed at the completion of construction.

3. TESTS

- a. Concealed work shall remain uncovered until required tests have been completed, but if necessary, tests on portions of the work may be made and those portions of the work may be concealed after being proved satisfactory. Repairs of defects that are discovered as a result of inspections or tests shall be made with new materials. Caulking of screwed joints, cracks, or holes will not be accepted. Test shall be repeated after defects have been eliminated.
- b. Drainage System Tests:
 - i. A water test shall be applied to all parts of the drainage systems before the pipes are concealed or fixtures set in place. The test may be applied in sections. All openings of each system to be tested shall be tightly closed except the highest opening above roof, and the entire system shall be filled with water up to the overflow point of this highest opening.
 - ii. All parts of the system shall be subject to not less than ten (10) feet of hydrostatic head except the uppermost ten (10) feet of the piping directly below the opening. The water shall remain in the system for not less than fifteen (15) minutes after which time no leaks at any joint or lowering of the water level at the overflow shall be visible.
- c. Water Supply System:
 - i. A water pressure test shall be applied to all parts of the water supply system before the piping is concealed or before the fixtures are connected. A hydrostatic pressure of not less than one hundred twenty-five (125) pounds per square inch shall be applied to the system, and there shall be no leaks at any point in the system at this pressure. An air or gas test is not acceptable.

4. STERILIZATION

- a. All the new water piping and affected existing water piping, including all valves, fixtures, fittings, and other devices connected hereto, shall be sterilized with a solution containing not less than fifty (50) parts per million of available chlorine. The chlorinating material shall be liquid chlorine gas-water mixture, calcium hypochlorite, sodium hypochlorite, or chlorinated lime and water mixture conforming to the standards of the American Water Works Association and shall be introduced into the system in an approved manner.

- b. The sterilization solution shall be allowed to remain in the system for a minimum period of twenty-four (24) hours, but until pronounced safe and fit for human consumption by the Owner based on samples drawn from the system and tested. During the sterilizing period all valves and outlets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until residual chlorine content is not greater than 0.2 parts per million unless otherwise directed. After the system has been flushed, additional samples will be taken and tests made; if the water is found unsafe for human consumption, the sterilization procedure specified herein before shall be repeated.

5. CLEANING AND ADJUSTING

- a. Upon completion of work, all surplus material and rubbish shall be removed from premises. Fixtures shall be cleaned; all valves adjusted; all escutcheons and plates installed; all floor drains cleaned, and all mortar and foreign matter removed from all exposed plumbing work.
- b. Any stoppage or discoloration or other damage to parts of the building, its finish, or furnishing, due to the Contractor's failure to properly clean the piping system shall be repaired by the Contractor without cost to the Owner.

6. EMERGENCY REPAIRS

- a. The Owner reserves the right to make, or have made, repairs to the plumbing system within the guarantee period as required to keep the equipment in operation when the Plumbing Contractor is not available to make the necessary repairs. These necessary repairs shall in no way void the Contractor's guarantee bond nor relieve the Contractor of his responsibilities during the bonding period.

7. PAINTING

- a. All factory finished metal surfaces of plumbing equipment installed that are damaged during construction shall be restored to the original condition.
- b. Contractor shall paint all iron and steel, including pipe hangers, that do not have a factory finish or galvanized finish used for support of equipment. Prime with one coat of oil base primer followed by one coat of oil base finish coat.

8. MAINTENANCE AND OPERATING MANUALS

- a. At the completion of this project the contractor shall furnish the Owner three (3) operating and maintenance manual s containing a brief description of each system and its various components. Instructions must give full details of the operation of all equipment installed, and shall include manufacturer's printed operating and maintenance instructions, detailed data and bulletins covering all material furnished under the contract giving all necessary illustrations and diagrams and a

composite schedule of periodic servicing and lubrication requirements and replacement parts.

9. AS BUILT DRAWINGS

- a. Contractor shall keep and maintain in good order a record of any waste, vent, or water piping that deviates from drawings for any reason. This record shall be made available to the Owner on the date of substantial completion and shall be legible and accurate so as to be directly transferable to an as-built reproducible drawing.
- b. Contractor shall provide to the Owner actual dimensions of all waste and water lines installed on exterior of building, giving dimensions to new and/or existing buildings.

10. GUARANTEE

The Contractor shall deliver the system to the Owner complete in first-class operating condition in every respect and shall guarantee the material and workmanship for a period of one (1) year from the date of acceptance. If, during that time, any defect should show up due to defective material, negligence, or want of proper care on the part of the Contractor, he shall furnish such new materials as are necessary to repair such defects and place same in working order at his own expense on receipt of notice of such from the Owner or Owners.

END OF SECTION 220000

SECTION 230000 – MECHANICAL REQUIREMENTS

A. GENERAL

1. GENERAL CONDITIONS

- a. Drawings, all Contract Documents, and Division-1 Specifications sections, apply to work of this section.
- b. Where the term "Contractor" is used, it shall mean the HVAC Contractor.
- c. Contractors bidding on this section are notified that they shall hold licenses for Heating H-2 and H-3 as issued by the State Board of Examiners of Plumbing and Heating Contractors.
- d. Reference shall be made to the Architectural, Structural, Plumbing and Electrical drawings and specifications for details of building construction and for coordination with other parts of construction.
- e. Contractor shall visit the job site before the submission of a bid and familiarize himself with existing conditions. Submission of a bid will be considered as evidence that the Contractor has visited the site and is familiar with existing conditions.

2. BIDDING

- a. The HVAC work shall be included under the General Contract.

3. SCOPE OF WORK

- a. The work to be done under this contract consists of furnishing all labor, materials, equipment, devices, appliances, tools, transportation, and services as required, and in performing all functions to complete and leave ready for operation the installation of the HVAC system in strict accordance with these specifications and applicable drawings; and subject to the forms and conditions of the contract.
- b. The work shall include the following items but is not intended to cover every item in detail. The list is not necessarily a complete list:
 - i. Heat Pump (DX Indoor Unit)
 - ii. Heat Pump (DX Outdoor Unit)
 - iii. Exhaust Fans
 - iv. Pipe Penetrations
 - v. Sheet Metal Work

4. INTENT

- a. It is the intention of the specifications and drawings to call for finished work, tested, and ready for operation. Work shall be installed in accordance with the plans and specifications using skilled workmen.
- b. It shall be the responsibility of this Contract or upon discovering any discrepancies in the drawings or specifications or points of conflict therein to immediately notify the Owner who will clarify such discrepancies or conflicts in writing before the work progresses beyond said point. No extras will be allowed because of failure to properly notify the Owner.

5. CODES, PERMITS AND INSPECTIONS

- a. All work under this specification shall comply with all local and state codes, laws, ordinances and regulations, particularly Volume III of the North Carolina State Building Code. Wherever the drawings and specifications are in excess of such laws, ordinances and regulations, the drawings and specifications shall hold.
- b. Contractor shall obtain permits and arrange all inspections necessary for the installation of this work, paying all fees in connection there with, and furnishing the Owner with certificates of inspection from all authorities having jurisdiction.
- c. No piping or other construction shall be covered up or concealed until it has been inspected, tested and approved. The Contractor shall furnish all labor, materials, fuel, equipment, and apparatus and bear all expenses of such tests as are hereinafter specified for the work under this section of the specifications.

6. DRAWINGS AND SPECIFICATIONS

- a. The HVAC drawings show the general arrangement of all piping, ductwork, equipment, and appurtenances and shall be followed as closely as actual building construction will permit.
- b. HVAC work shall conform to the requirements shown on all the drawings. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories, which may be required. The Contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings; valves and accessories as may be required to meet such conditions.
- c. The drawings and specifications are complimentary each to the other and what is called for by one shall be as binding as if called for by both.
- d. Omission of particular reference to any item necessary for a complete installation and proper operation thereof, shall not relieve the Contractor of the responsibility of furnishing same.

7. COORDINATION OF WORK

- a. The Contractor shall coordinate the work with other contractors on the project. All work shall be so arranged that there will be no delay in the proper installation and completion of any part or parts of all piping systems and equipment. Work shall be installed in proper sequence with other trades, and without necessary delays.
- b. The layout shown shall be followed as closely as circumstances will permit but the Contractor must lay out his work so as not to conflict with other trades and to avoid any unnecessary cutting of or damage to walls, floors or other supporting structural members.
- c. Whenever interferences might occur before installing any of the work in question, the Contractor shall consult with other contractors and shall come to an agreement with them as to the exact location and level of his piping and other parts of his equipment, subject to final approval of the Owner.
- d. Locations of pipes, equipment, and appurtenances shall be adjusted to accommodate the work to interferences anticipated and encountered. The Contractor shall determine the exact route and location of each duct prior to fabrication. Pipe lines which pitch shall have right of way over ductwork.
- e. Offsets and changes in direction in ducts shall be made as required to maintain proper headroom and to avoid sloping pipelines whether or not indicated on the drawings. The Contractor shall furnish and install all accessories as required to effect these offsets and changes in direction.

8. EQUIPMENT AND MATERIALS

- a. Catalog numbers and trade names in these specifications and noted on the drawings are intended to describe the material, devices or apparatus wanted. Similar materials, devices or apparatus of other manufacturers, if of equal quality, capacity and character, may be substituted on the written approval of the Owner. Proposed substitutions with descriptive data shall be submitted to the Owner at least ten days before the Bid date. If the Contractor fails to comply with the provisions of this paragraph, he shall be required to furnish all materials and equipment as specified.
- b. All materials shall be new and bear the manufacturer's name, trade name and the UL label in every case where a standard has been established for the particular material. The equipment to be furnished shall be essentially the standard product of a manufacturer regularly engaged in the production of the required type of equipment and shall be the manufacturer's latest approved design.
- c. Equipment and materials shall be delivered to the site and stored in original containers suitably sheltered from the elements but readily accessible for inspection until installed.

- d. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.
- e. Equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury and theft. Damage or defects developing before acceptance of the work shall be made good at the Contractor's expense.
- f. Dimensions: It shall be the responsibility of the Contractor to insure that items to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections, and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the drawings and specifications.
- g. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation of all equipment and materials. The Contractor shall promptly notify the Owner in writing of any conflict between any requirement of the contract documents and the manufacturer's directions and shall obtain the Owner's written instruction before proceeding with the work. Should the Contractor perform any work that does not comply with the manufacturer's directions or such written instruction from the Owner, he shall bear all costs arising in correcting the deficiencies.

9. EQUIPMENT ACCESSORIES

- a. The Contractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work, ready for use, occupancy and operation by the Owner.
- b. Supports: The Contractor shall support plumb, rigid and true to line all work and equipment furnished under this section. The Contractor shall study thoroughly all general, structural, mechanical and electrical drawings, shop drawings, and catalog data to determine how equipment, fixtures, piping, etc. are to be supported, mounted or suspended and shall provide extra steelbolts, inserts, pipe stands, brackets and accessories for proper support whether or not shown on the drawings.

10. CUTTING, PATCHING AND REPAIRING

- a. In new construction the General Contractor will provide all openings in wall, floor, and roof construction required by HVAC Contractor for installation of his work provided complete information is furnished to the General Contractor at the time required. Failure to provide necessary information will necessitate provisions of additional required openings, chases, recesses, etc., by HVAC Contractor at his own expense, and he shall be fully responsible for the proper cutting and patching of such construction as approved and directed by the Owner.

- b. Each trade shall bear the expense of all cutting, patching, repairing or replacing of the work of other trades required because of his fault, error tardiness or because of any damage done by him.
- c. Under no circumstances shall the Contractor cut any structural beam or support without prior approval and instructions from the Owner.
- d. If HVAC Contractor installs HVAC work through exposed finish walls, ceiling or floor after they are in place, the HVAC Contractor shall close excess openings around his work to match finish surface.

11. SHOP DRAWINGS AND SUBMITTAL DATA

- a. The Contractor shall submit to the Owner after award of the contract, a folder containing catalog cuts and descriptions giving the name of the manufacturer, trade name, type, catalog number and location in work of all equipment which he proposes to use in the execution of the contract.
- b. After receiving the approval of the Owner, it shall be the responsibility of the Contractor to verify all dimensions and arrangements of equipment or apparatus with job conditions to insure correct application and installation.
- c. Contractor shall then prepare, or cause to be prepared, shop drawings showing in detail (a) the equipment he has been authorized to install, and (b) the methods by which the installation of his work is to be made. Shop drawings shall show make, model number, capacity, dimensions, construction, and all pertinent data regarding the equipment to be furnished. Shop drawings shall bear Contractor's stamp certifying that he has checked each item of equipment for size, location, capacities and performance that each item meets all conditions indicated on drawings and specified.
- d. The manufacturer's standard drawings will be accepted for manufacturer's standard production items if certified for installation at the location noted. Shop drawings shall be made for all items of equipment, specially fabricated for this contract.
- e. Shop drawings shall be submitted as soon after award of the contract as possible, allowing ample time for checking and processing and the Contractor shall assume responsibility for delays incurred due to rejected items. Failure to submit suitable drawings will not be considered sufficient cause for extension of time.
- f. Approval is solely for the purpose of determining suitability and will in no way absolve the Contractor of his responsibility for the correctness of measurements, quantities, or performance. Approval of shop drawings shall not constitute a change in the contract requirement.
- g. Shop drawings must comply with the requirements of all regulatory bodies having jurisdiction.

- h. Contractor shall furnish at least five (5) copies of submittal data. Three (3) copies will be returned to the Contractor.

12. WORKMANSHIP

- a. The work throughout shall be executed in the best and most thorough manner, under the periodic observation of and to the satisfaction of the Owner and the Engineer who will jointly interpret the meaning of the drawings and specifications and shall have the power to reject any work or materials which, in their judgment, are not in full accordance therewith.

13. SINGULAR

- a. In all cases where a device or piece of equipment is referred to herein or on the plans in the singular number, it is intended that such reference shall apply to as many such devices as are required to complete the installation.

14. USE OF THE WORD “PROVIDE”

- a. Herein, where the word "provide" is written in these specifications, "provide" shall be understood to mean provide complete in place, that is, "furnish and install".

15. SUPERVISION AND SUPERINTENDENCE

- a. The Contractor shall, during the progress of the work, maintain a competent superintendent who shall not be changed except if he proves unsatisfactory to the Contractor or the Owner. Efficient supervision shall be given to all work under this contract.

B. PRODUCTS

1. SPLIT SYSTEM HEAT PUMP (DX OUTDOOR UNIT)

- a. Unit casing shall be galvanized steel, zinc phosphated, baked enamel finish and fully weatherproof.
- b. Condenser coil shall be of non-ferrous construction, aluminum plate fins, mechanically bonded to seamless copper tube, sub-cooling circuitry.
- c. Condenser fans and motors shall be direct drive, propeller type fins, Class B motor insulation, inherent protection, permanently lubricated, resiliently mounted; fans shall have safety guards.
- d. Controls shall be factory wired and include high and low pressure stats, compressor overload devices, short cycling timer (5 min.), discharge line thermostats, oil pressure switches, pressure relief valve, and circuit breakers.
- e. A wire guard shall be provided over the condenser coils for protection from physical damage. The wire guard shall be either factory mounted or field erected.

- f. Compressor shall be hermetically sealed, high efficiency, with special lubricating system, bearing surfaces and motor installation, internal over-current, over temperature, and over-pressure protection and crankcase heater. The compressor shall have a five (5) year warranty.

2. SPLIT SYSTEM HEAT PUMP (DX INDOOR UNIT)

- a. Casing shall be galvanized steel, bonderized with baked enamel finish.
- b. Section shall have forward curved blades, centrifugal type, belt driven. Fan shall be statically and dynamically balanced and shall run on permanently lubricated bearings.
- c. Cooling coils shall be of non-ferrous construction with mechanically bonded aluminum plate fins on copper tube.
- d. Casing shall be insulated with fire retardant insulation in accordance with NFPA 90A. Insulation shall be secured to casing panels with waterproof cement and permanent fasteners.
- e. Condensate drain pan shall be furnished with threaded pipe connections and shall extend completely under the coil section. Internal insulation shall be wrapped waterproof and of rigid closed-cell polyurethane. Insulated copper piping is to be used for condensate drain lines.
- f. Electric heater assembly shall include circuit breakers, automatic re-setting limit switches and heat limiter for primary and secondary over-current and thermal protection.

3. EXHAUST FANS

- a. Bathroom Exhauster: Provide bathroom exhauster, designed for ceiling mounting, of type, size, and capacity as shown in Equipment Schedule. Fans shall be as manufactured by Cook, Carnes, Broan, Nutone, or Penn.
- b. Provide HVI (Home Ventilating Institute) Certified Ratings Seal. Provide galvanized steel housing with fan impeller directly connected to motor, and removable as unit from housing for service. Provide integral backdraft damper in fan discharge. Provide stainless steel louvered grille with flange on intake with thumbscrew attachment to fan housing. Provide permanent split-capacitor motor, permanently lubricated, with grounded cord and plug. Provide junction boxes for electrical connection on housing, and receptacle for motor plug-in.

4. PIPE PENETRATIONS

- a. Pipe penetrations through floor slabs and fire rated walls shall be restored to the slab or fire rated wall's original rating and shall be sealed with impervious noncombustible materials sufficiently tight to prevent transfer of smoke or

combustion gases from one side of the wall or slab to the other in accordance with UL methods.

- b. As appropriate to the penetration size and location, provide firestopping using one of the following:

High-temperature non-shrink grout shall be installed in accordance with recommendations of ACI, CSI and the manufacturer's specifications.

Fill openings with Thermofiber Safing insulation.

Caulk full depth of wall or floor with 3M-fire barrier material - No. 25 caulk or 303 putty.

- c. Penetrations through construction shall be neatly drilled or cut, and the opening completely filled around the penetrating pipe with the approved firestopping material. Solid masonry and concrete walls as well as concrete slabs shall be core drilled. Diameter of core drilled holes shall be from 3/4 inch to 1-1/2 inch bigger than the outside diameter of pipe. Pipe shall be secured within 18 inches of the penetration, both sides, from other than the firewall or slab itself.

5. SHEET METAL WORK

- a. Provide all ducts, dampers and accessories as indicated on the drawings and specified herein.
- b. Duct sizes shown on drawings are actual sheet metal sizes. Plans are generally diagrammatic and Contractor shall make take offs as required to install ducts in spaces provided, however, the Contractor shall secure the Owner's approval before re-routing or changing duct sizes.
- c. Sheet metal work shall be constructed in accordance to S MACNA, Inc. Low Velocity Duct Construction Standards.
- d. Dampers, volume (Manual). Provide the manually operated volume control dampers necessary for the proper balancing of the air handling system. They shall have an indicating device with lock to hold the damper in position for proper setting. Wye branch connections to have splitter dampers. All branch ducts to registers shall have a damper.
- e. Ductwork: All low velocity ductwork shall be constructed of galvanized steel in accordance with Table 1 and Plates 5 through 15 of the low velocity duct standard. Galvanized steel shall be of lock forming quality and shall have a galvanized coating of 1 1/4 ounces total for both sides of one (1) square foot of a sheet.
- f. Flexible ductwork: All flexible ductwork within the building envelope shall have a minimum R-value of 6.2. All flexible ductwork outside of the building envelope shall have a minimum R-value of 8.0.

- g. Elbows, Radius: Shall be constructed in accordance with Plate 21, Figure B of the low velocity duct standard.

C. EXECUTION

1. ELECTRICAL CONNECTION OF EQUIPMENT

- a. Wiring from disconnect switches, junction boxes, panel board circuit breakers, etc. up to mechanical equipment shall be by the electrical contractor. Final electrical connections to mechanical equipment shall be by this contractor.
- b. Control wiring and control connections control for heating and air conditioning systems is by this Contractor.

2. Tests shall be made on all equipment and apparatus furnished under this contract for verification of performance of equipment and systems.

- a. The Contractor shall indicate to the Engineer, at least five days prior to the scheduled time, when he will be prepared for a complete system checkout.
- b. Operating conditions of all controls and major components shall be verified in the presence of the Engineer and the Owner's representative.
- c. Heating and air conditioning system shall be balanced, adjusted and placed into service by personnel skilled as a result of training and experience in working with air distribution systems.
- d. A certified independent test and balance contractor shall perform testing and balancing. The test and balance contractor shall be certified by National Environment Balancing Bureau (NEBB) or Associated Air Balance Council (AABC).
- e. All necessary equipment, forms, reports, etc. required to perform the system testing and balancing shall be as recommended in the above named procedures.
- f. The Contractor shall submit to the Engineer a letter stating the procedures, instruments, forms, etc. to be used for testing and balancing heating and air conditioning systems.
- g. Final balancing data shall be submitted to the Engineer prior to final acceptance. After completion of the work, the Contractor shall state in a letter to the Engineer that the work conforms to plans and specifications. This Letter of Compliance is to be issued prior to final inspection and acceptance by the Owner.
- h. A copy of the approved final balancing data should be included in the Maintenance and Operations Manuals.
- i. After testing, all adjustable pitch motor pulleys shall be replaced with fixed pitch pulleys.

3. PAINTING

- a. Contractor shall paint all iron and steel not having a factory finish or galvanized finish used for support and hanging equipment throughout building. One coat of primer shall be used followed by one coat of oil base paint with colors selected by the Owner.
- b. All painted equipment with damaged areas be painted to match original finish.

4. CLEAN-UP

- a. At the completion of all work, this Contractor shall be responsible for cleaning up all rubbish, leaving the system in perfect operating condition. He shall further clean up rubbish daily in such a manner that the job shall present a neat appearance. Work shall be accomplished to the satisfaction of the Owner.

5. MAINTENANCE AND OPERATING MANUALS

- a. At the completion of this project the Contractor shall furnish the Owner three (3) operating and maintenance manuals containing a brief description of each system and its various components. Instructions must give full details of the operation of all equipment installed, and shall include manufacturer's printed operating and maintenance instructions, detailed data and bulletins covering all material furnished under the contract giving all necessary illustrations and diagrams and a composite schedule of periodic servicing and lubrication requirements and replacement parts.

6. AS BUILT DRAWINGS

- a. Contractor shall keep and maintain in good order a record of any deviations from drawings for any reason. This record shall be made available to the Owner on the date of substantial completion and shall be legible and accurate so as to be transferable to as-built reproducible drawing.

7. GUARANTEE

- a. The Contractor shall deliver the system to the Owner complete in first-class operating condition in every respect and shall guarantee the material and workmanship for a period of one year from the date of acceptance. If during that time any defect should show up due to defective material, negligence, or want of proper care on the part of the Contractor, he shall furnish such new materials as are necessary to repair such defects and place same in working order at his own expense on receipt of notice of such from the Owner.

END OF SECTION 230000

SECTION 260000 GENERAL PROVISIONS ELECTRICAL

PART 1 - GENERAL

1.1 Scope of Work

- A. This Contractor shall provide all materials, equipment and labor necessary to install and set into operation the electrical equipment as shown on the Engineering Drawings and as contained herein.

1.2 Quality Assurance

- A. See the General and Supplementary General Conditions.
- B. All work shall be in accordance with the North Carolina State Building Code, which includes the 2018 edition of the National Electrical Code.
- C. Wherever the words "Approved", "Approval", and "Approved Equal" appear, it is intended that items other than the model numbers specified shall be subject to the approval of the Engineer.
- D. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- E. All material and equipment that the Contractor proposes to substitute in lieu of those specified shall be submitted to the Engineer ten (10) days prior to the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified.

1.3 Submittals

- A. See General and Supplementary General Conditions and Division 1.
- B. Within ten (10) days after notification of the award of the Contract and written notice to begin work, the Contractor shall submit for approval to the Architect/Engineer a detailed list of equipment and material which he proposes to use. Items requiring submittal data for approval will be noted at this time. Six (6) sets of submittal data shall be provided for approval.
- C. Each submittal shall bear the approval of the Contractor indicating that he has reviewed the data and found it to meet the requirements of the specifications as well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitution for specified items. Acceptance for approval shall be in writing from the Engineer.
- D. The Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. Final payment will be contingent on receipt of these as-built plans.
- E. The Contractor shall furnish an electronic set of maintenance and operating instructions, parts lists, electrical circuit wiring diagrams, all submittal data, and sufficient manufacturer's literature to operate and maintain all equipment.

- F. The Contractor shall submit to the Engineer a duplicate set of final electrical inspection certificates prior to final payment.

1.4 Product Delivery, Storage and Handling

- A. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.
- B. The Contractor shall protect all material and equipment from breakage, theft or weather damage. No material or equipment shall be stored on the ground.
- C. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.

1.5 Work conditions and Coordination

- A. The Contractor shall review the mechanical plans to establish points of connection and the extent of electrical work to be provided in his Contract.
- B. This Contractor shall be responsible for all electrical work and make final connections to equipment installed in his Contract. Unless otherwise noted, this Contractor shall wire to disconnect switches, junction boxes, or circuit breakers as provided in his Contract.
- C. All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be approved by Architect/Engineer and shall be at the Contractor's expense with no extra cost to the owner.

1.6 Guarantee

- A. See the General and Supplementary General Conditions.
- B. Where extended warranties or guarantees are available from the manufacturer, the Contractor shall prepare the necessary Contract Documents to validate these warranties as required by the manufacturer and present them to the Owner.

PART 2 - PRODUCT

- 2.1 Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Materials and equipment found defective shall be removed and replaced at the Contractor's expense.
- 2.2 The Contractor shall provide nameplates for identification of all equipment, switches, panels, transformers, etc. The nameplates for 120/208-volt panels shall be laminated phenolic plastic, blue front and back with white core, white engraved letters (1/2" minimum) etched into the white core. The nameplates for 277/480-volt panels shall be laminated phenolic plastic, black front and back with white core, white engraved letters (1/2" minimum) etched into the white core. Name tags to be mounted with self-tapping sheet metal, stainless steel screws.
- 2.3 All materials and equipment be approved third party labeled or bear re-examination listing where such approval has been established for the type of device in question.

PART 3 - EXECUTION

3.1 Inspection

- A. If any part of this Contractor's work is dependent for its proper execution or for its subsequent efficiency or appearance on the character or conditions of contiguous work not executed by him, the Contractor shall examine and measure such contiguous work and report to the Architect or Engineer in writing any imperfection therein, or conditions that render it unsuitable for the reception of this work. Should the Contractor proceed without making such written report, he shall be held to have accepted such work and the existing conditions and he shall be responsible for any defects in this work consequent thereon and will not be relieved of the obligation of any guarantee because of any such imperfection or condition.
- B. It is the responsibility of the electrical contractor to notify the authority having jurisdiction to schedule required inspections including rough-in, above ceiling and final inspections.

3.2 Installation

- A. All work shall be performed in a manner indicating proficiency in the trade.
- B. All conduit, pipes, ducts, etc., shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.
- C. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
- D. All patching shall be done in such a manner as to restore the areas or surfaces as to match existing finishes.
- E. The Contractor shall lay out and install his work in advance of pouring concrete floors or walls. He shall furnish and install all sleeves or openings through poured masonry floors or walls above grade required for passage of all conduits, pipes or duct installed by him. The Contractor shall furnish and install all inserts and hangers required to support his equipment.
- F. Grounding
 - 1. All grounding shall be in accordance with the requirements of the NEC.
 - 2. Install a separate green grounding conductor with the circuit conductors in each conduit. Use of the conduit only shall not be an acceptable means of equipment grounding.
 - 3. All grounding conductors shall be sized per Article 250.122 of the NEC.
 - 4. The ground system shall be tested with an "Earth Megger" and the test report submitted to the Engineer. If resistance exceeds 25 ohms provide an additional driven ground rods separated by a minimum of 6' interconnected with #3/0 copper. A copy of the test report shall be submitted to the electrical engineer.
 - 5. All ground points shall be accessible for inspection.
 - 6. Boxes with concentric, eccentric or over-sized knockouts shall be provided with bonding bushings and jumpers. The jumper shall be sized per NEC Table 250.122 and lugged to the box.

3.3 Electrical Identification

- A. Furnish and install engraved laminated phenolic nameplates for all safety switches, panel boards, transformers, switchboards, motor control centers and other electrical equipment supplied for the project for identification. Nameplates shall be securely attached to equipment with self-tapping

stainless-steel screws; if the screw sharp end is protected; otherwise Rivets shall be used. Letters shall be approximately 1/2-inch-high minimum. Embossed, self-adhesive plastic tape is not acceptable for marking equipment. Nameplate material colors shall be:

1. Blue surface with white core for 120/208-volt equipment.
 2. Black surface with white core for 277/480-volt equipment.
 3. Bright red surface with white core for all equipment related to fire alarm system.
 4. Dark red (burgundy) surface with white core for all equipment related to security.
 5. Green surface with white core for all equipment related to “emergency” systems.
 6. Orange surface with white core for all equipment related to telephone systems.
 7. Brown surface with white core for all equipment related to data systems.
 8. White surface with black core for all equipment related to paging systems.
 9. Purple surface with white core for all equipment related to TV systems.
- B. All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by tags with string or wire attached to conduit or outlet.

3.4 Performance

- A. The Contractor shall perform all excavation, backfilling, and patching operations as indicated on the drawings.

3.5 Erection

- A. All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided by this Contractor.

3.6 Field Quality Control

- A. The Contractor shall conform to the requirements of Division 3 for concrete testing.
- B. The Contractor shall test his entire installation and shall furnish the labor and materials required for these tests. Tests shall be performed in accordance with the requirements of the section of the specifications and in accordance with the requirements of the State Ordinances and Codes, and the National Electrical Code. The Contractor shall notify the Engineer of his readiness for such test. Final inspections are required along with final inspection certificates are required, prior to authorization of final payment.
- C. Testing required for compliance with the Contract shall be stated in subsequent sections. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information. All required documentation of readings indicated above shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.
- D. Documentation

1. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information.
2. All required documentation of readings indicated above shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.

3.7 Adjust and Clean

- A. All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
- B. Factory painted equipment shall not be repainted unless damaged areas exist. These areas shall be touched up with a material suitable for the intended service. In no event shall nameplates be painted.
- C. At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his Contract (in the presence of the Engineer).

END OF SECTION 260000

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SECTION 260520 WIRES AND CABLES

PART 1 - GENERAL

- 1.1 All conductors shall be properly marked showing manufacturer's name, insulation type, voltage rating and wire size. All insulation is to be rated for minimum of 600 volts.
- 1.2 Wire sizes shall be as shown. No wire smaller than No. 12 AWG shall be used. The maximum conductor size shall be 500 KCMIL.
- 1.3 Where the conductor length from the panel to the first outlet on a 120 volt exceeds 50 feet, the branch circuit conductors from the panel to the first outlet shall be increased by at least one size. Refer to the wire size chart on the drawings. Per NEC 250.122(B), equipment grounding conductors, where installed shall be increased in size proportionately according to the circular mil area of the ungrounded conductors.
- 1.4 Conductors shall be manufactured by US Wire and Cable, Triangle, Okonite, Southwire, or approved equivalents.
- 1.5 Wiring for 120/208-volt systems and 277/480-volt systems shall not be mixed in the same race way, pull or junction box.

PART 2 - PRODUCT

- 2.1 All conductors shall be copper and shall conform to Underwriters' Standards. Wires No. 10 and smaller shall be solid. Wires 8 and larger shall be stranded.
- 2.2 All wire shall be labeled two (2) feet on centers giving size, type voltage, rating, and manufacturer's name. Wire #6 and smaller #6 shall be factory color coded. Wire larger than #6 may be color coded with approved 2000-volt colored tape at all terminals of the run, and at all junctions.
- 2.3 Where applicable, all wire shall be color coded as follows, or approved by the Engineer:
 - A. 120/208-volt system:
 - Phase A - Black
 - Phase B - Red
 - Phase C - Blue
 - Neutral - White
 - Ground - Green
 - B. 277/480-volt system:
 - Phase A - Brown
 - Phase B - Orange
 - Phase C - Yellow
 - Neutral - Natural Gray
 - Ground - Green
- 2.4 Insulation type shall be UL labeled for the appropriate type of use and temperature. Insulation types are as follows:
 - A. The insulation type for interior wiring shall be dual-rated THHN/THWN or XHHW.

- B. The insulation type for wiring in exterior wet locations shall be THWN-2 or XHHW-2.

PART 3 - EXECUTION

- 3.1 Conductors shall be run in conduit and shall be continuous from outlet to outlet. Splices will not be made except within accessible outlet or junction boxes, troughs, or gutters.
- 3.2 Solid conductors shall be spliced by using Ideal "wing-nuts", 3M Company's "Scotchlok" connectors for branch circuit splices. Crimp connectors will not be allowed for branch circuit splicing.
- 3.3 Joints in stranded conductors shall be spliced by approved mechanical connectors and gum rubber tape or friction tape. Solderless mechanical connectors for splices and taps, provided with U/L-approved insulating covers, may be used instead of mechanical connectors plus tape.
- 3.4 On mechanical splices, taps or joints taping shall be with at least two (2) layers of approved gum rubber tape which will be laid on the half-lap followed by at least one (1) layer of friction or plastic tape laid on with half-lap. It is intended that all taping shall be a permanently secured insulation equal to that of the wire.
- 3.5 All conductors in any conduit shall be at one specific voltage. Conductors of different voltages shall be run in separate conduits.
- 3.6 Neutral conductors shall be properly installed as to prevent grounding of the neutrals in any conduit. Multi-wire circuits with shared neutral conductors are not allowed. Each single pole load shall have individual neutral for each circuit.
- 3.7 Neatly train and lace wiring inside boxes, equipment, and panelboards.
- 3.8 Make conductor lengths for parallel circuits equal.
- 3.9 Pull all conductors into a raceway at the same time. Use third party approved wire pulling lubricant for pulling #4 AWG and larger wires.
- 3.10 Insulation Resistance Testing.

All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500-volt megger. The procedures listed below shall be followed:

- A. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG wire and smaller, 250,000 ohms or more for #4 AWG wire or larger, between conductors and between conductor and the grounding conductor.
- B. After all fixtures, devices and equipment are installed and all connections completed to each panel, the contractor shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and the grounded enclosure. If this reading is less than 250,000 ohms, the contractor shall disconnect the branch circuit neutral wires from this neutral bar. He shall then test each one separately to the panel and until the low readings are found. The contractor shall correct troubles, reconnect and retest until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
- C. The contractor shall send a letter to the engineer certifying that the above has been done and tabulating the megger readings for each panel. This shall be done at least four (4) days prior to the final inspection.

3.11 Use of split bolt connectors is not acceptable.

3.12 Prior to energizing, feeders and service conductor cables shall be tested for electrical continuity and short circuits. A copy of these tests should be sent to the engineer of record and the owner.

END OF SECTION 260520

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SECTION 260533 BOXES AND CABINETS

PART 1 - GENERAL

- 1.1 The Electrical Contractor shall provide junction boxes, pull boxes, cable, support boxes, and wiring troughs as required by NEC and as otherwise indicated in the Drawings.
- 1.2 All necessary mounting hardware and accessories shall be provided for a complete installation.

PART 2 - PRODUCT

- 2.1 Outlet and junction boxes shall be 4" minimum size, octagonal in ceilings, 4" square or rectangular (4" x 4" minimum for walls) except as noted below. Ceiling outlet boxes shall not be less than 1 1/2" deep, but in no case shall the size and depth of boxes be less than the required by the NEC.
- 2.2 Outlet boxes shall be equipped with plaster rings of appropriate depth to finish flush with finished walls. Outlets in exposed masonry wall shall be equipped with extra deep square corner tile rings so that box may be installed in the core of the block.
- 2.3 Outlets for concealed work and ceiling outlets for exposed work shall be galvanized stamped steel. Boxes shall be as manufactured by Steel City Electric Company, Metropolitan, B & C or equivalent.
- 2.4 Wall outlets for exposed conduit work shall be Crouse- Hinds, Appleton, Walker, or equal, series FS and FD switch and receptacle threaded hub boxes, with matching FS and FD covers.
- 2.5 Junction boxes for change of direction or feeder taps shall be furnished where required, shall be of adequate size to prevent crowding conductors in accordance with the requirements of the electrical code and job requirements and shall be accessible.
- 2.6 Junction boxes on finished wall and ceilings shall be flush with covers.
- 2.7 Junction boxes larger than 5" square shall be galvanized and without pre-formed knockouts.

PART 3 - EXECUTION

- 3.1 Boxes and troughs shall be supported independently of conduit entering them. Brackets, threaded rod hangers with lock nuts, bolts, or other suitable supporting methods may be used.
- 3.2 Thru-the-wall outlet boxes shall not be permitted. Outlet boxes shown back to back on plans, shall be separate boxes connected where required using a loop of flexible metallic conduit with ground wire. Boxes shall be separated a minimum of 18 inches apart.
- 3.3 In general, outlets shall be installed at the heights indicated on the fixture and symbol legend.
- 3.4 Each outlet designated on the plans shall be provided with an outlet box.
- 3.5 Each outlet box which supports a fixture shall be provided with a fixture stud into the outlet box. Outlet box and/or fixture stud shall be attached with not less than three screws or bolts.
- 3.6 Exterior outlets shall be provided with watertight gaskets and covers.

END OF SECTION 260533

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SECTION 260545 CONDUIT AND CONDUIT FITTINGS

PART 1 - GENERAL

- 1.1 Conduit shall be delivered to the project site in bundles of full-length pipes, each length marked with the trademark of the manufacturer and the Underwriters' Laboratories, Inc. stamp. Each conduit length shall be straight, true and free from scales, blisters, burrs and other imperfections.
- 1.2 Within the building parameters and above the floor slab, the rigid steel conduit specified shall be used unless specifically noted otherwise.
- 1.3 Conduit size for control wiring shall be a minimum of one-half (1/2) inch conduit. All branch circuit conduit shall be a minimum of one-half (1/2) inch. Percent filled and derating shall be in accordance with the National Electrical Code. Flexible metal and water-tite ("sealtite") conduit in size 1/2" and larger shall be acceptable for motor, appliance, and fixture connections from fixture junction boxes or appliance/motor disconnects provided a ground wire is installed in the flex and the flex assembly is an integral part of the fixture, shipped from the same factory as the fixture, and 3rd party agency approved for such use. This same requirement shall apply for motor/appliance connections.
- 1.4 All conduit shall be installed in accordance with the National Electrical Code.
- 1.5 Conduit shall be manufactured by American Conduit, Allied, Cantex, Carlon or equivalents.
- 1.6 Conduit fittings shall be manufactured by Rayco, T & B, Crouse Hinds, or equivalents.
- 1.7 Surface mounted raceway shall be used as noted on the plans in lieu of exposed conduit. Surface mounted raceway shall be manufactured by Wiremold or approved equivalents.

PART 2 - PRODUCT

- 2.1 Thin Wall Conduit and Fittings
 - A. Electrical metallic tubing (EMT) shall be cold-rolled steel tubing with zinc coating on the outside and protected on the inside by a zinc, enamel or equivalent corrosion-resistant coating conforming to the latest requirements of ANSI. Conduit shall meet the Rigid Conduit Association Standards.
 - B. Electrical metallic tubing fittings shall be all steel plated hexagonal threaded compression type. No pot metal, indenter, or set screw fittings, shall be used. EMT connectors shall have insulated throats.
- 2.2 Rigid Steel Conduit and Fittings
 - A. Rigid steel conduit, including elbows and nipples, shall be standard weight, mild steel pipe, hot dipped galvanized, sherardized or zinc-coated conforming to the requirements of ANSI C80.1, 1966 or later edition. Rigid steel conduit shall also meet the latest requirements of Underwriters' Laboratories, Inc. Standards for Rigid Metallic Conduit.
 - B. Fittings shall be all steel plated hexagonal threaded fitting.
- 2.3 Flexible Metal Conduit and Fittings
 - A. Flexible metal conduit shall be of the best grade interlocking spiral strip steel. The interlocking spiral strip construction shall be such as to permit bending of the conduit to a radius of four (4) times its internal diameter without distorting at any point. The interior and the exterior of the flexible conduit shall be smooth and free of burrs, sharp edges, or other defects which could damage the wire.

- B. Fittings shall be of the approved types, made of malleable iron and hot dipped galvanized.
- C. All connectors shall be steel compression fittings with insulated throats.
- D. Where watertight flexible conduit is required, it shall have an outer sheath of material similar to PVC.

2.4 Non-metallic Conduit

- A. Non-metallic conduit shall be UL listed, for its application. It shall be resistant to sunlight and chemical and moisture atmospheres and rated for use with 90 degrees Celsius conductors.
- B. The installation and usage of rigid non-metallic conduit shall comply with Article 352 of the National Electrical Code, along with any related or referenced sections.

PART 3 - EXECUTION

3.1 General

- A. All conduit shall be run tight against walls, columns or ceilings.
- B. The conduit shall bend cold 90 degrees about a radius equal to ten (10) times its own diameter without signs of flaw or fracture in either pipe or protective coverings. All bends and offsets shall be made on a forming tool to prevent the conduit or its coating from being damaged in the bending. Conduit bends shall have a radius not less than ten (10) times the conduit diameter.
- C. Where conduits join any couplings or threaded fittings, the ends shall be made watertight. (All conduit runs, including boxes, couplings, and fittings used therein, shall be so installed and equipped as to prevent water from entering the conduit.)
- D. All conduits shall be carefully cleaned before and after erection. After cleaning, all ends of conduits shall be free from burrs and inside surfaces shall be free from imperfections likely to injure the wires or cables.
- E. In every instance, conduit shall be installed in such a manner that the conductors may readily and easily be drawn or pulled in without strain or damage to the insulation; and, also, so that defective conductors may be readily and easily withdrawn and replaced by new conductors. Long radius bends and a sufficient number of approved pull and junction boxes shall be approved for this purpose, and as may be directed by the Engineer. All conduit shall be securely supported and grounded.
- F. In unfinished areas, exposed conduit shall be run to conform to the building lines with special emphasis on neatness. Turns shall be made with galvanized outlet boxes, junction boxes, factory fittings and/or symmetrical bends. Locknuts and bushings shall be employed to provide full grounding and adequate protection of insulation. Double locknuts shall be used on all conduits entering sheet metal enclosures.
- G. Support for all conduit shall be in accordance with the National Electrical Code. Conduit shall be supported by approved pipe straps or clamps, secured by means of toggle bolts on hollow masonry, expansion shields and matching screws or standard pre-set inserts on concrete or solid masonry, machine screws or bolts on metal surfaces, and wood screws on wood construction.
- H. All empty conduit systems shall be capped or terminated in a junction box and shall be provided with nylon pull cord inside for future use.

- I. Conduit terminating below grade shall be provided with means to prevent entry of dirt or moisture. Depth of burial shall not be less than two (2) feet below grade. All termination points shall be accurately marked and dimensioned on the As-Built Plans.
- J. Where conduits of any type pass over a building expansion joint, a standard "expansion joint fitting" compatible with the type of raceway shall be provided.
- K. Conduits installed on the interior of exterior building walls shall be spaced off the surface a minimum of 1/4" using "clamp-backs" or strut.

3.2 Thin Wall Conduit and Fittings

- A. Except for service and feeder conduits, electrical metallic tubing and fittings may be installed in lieu of rigid conduit in dry construction in furred spaces, ceiling cavities, chase spaces, interior portions other than concrete and solid plaster, or for exposed work except on mechanical structure or supports.
- B. Electrical metallic tubing shall not be installed.
 - 1. Where exposed to severe corrosive conditions and/or severe physical damage,
 - 2. Nearer than four (4) feet from finished floor in exposed areas
 - 3. In trade sizes larger than two (2) inches
 - 4. Located in exterior walls or in poured concrete.
 - 5. Any location outdoors.
 - 6. Where tubing, coupling, elbows and fittings would be in direct contact with the earth or underground (in/below slab-on-grade or in earth).
- C. A transition between a run of rigid conduit concealed in a wall and a run of thin wall conduit along a ceiling shall be made in an outlet box above the ceiling, if accessible, near the wall.

3.3 Rigid Steel Conduit and Fittings

- A. All conduit terminations shall be provided with insulating bushings.
- B. Condulet fittings shall not be used in lieu of pull boxes.
- C. Except where located under the ground floor slab, all service and feeder conduit shall be heavy wall (rigid galvanized).
- D. Rigid steel conduit shall be installed in exterior masonry walls, in wet locations where subject to severe physical damage, or where conduit trade size is two and one half (2 1/2) inches or larger.

3.4 Flexible Metal Conduit and Fittings

- A. Flexible metallic conduit shall be provided at the end of each conduit run terminating at the conduit box on electric motors, transformers or other equipment.
- B. The length of flexible conduit shall be in accordance with the National Electric Code.

3.5 Non-Metallic Conduit

- A. Thin wall rigid non-metallic conduit (schedule 40 PVC) shall only be used for concrete encasement.
- B. Except where embedded in concrete, conduit shall be supported to permit adequate lineal movement to allow for expansion and contraction of conduit due to temperature change. Where a temperature change in excess of 14 degrees Celsius is anticipated, such as direct burial, exposed outside of the building, or in un-insulated spaces inside the building (attics, crawl spaces, etc.), expansion joints shall be installed in accordance with the manufacturer's specifications.
- C. Heavy wall non-metallic conduit (schedule 80 PVC) shall be used where conduits are direct buried exterior to the building or exposed exterior to the building.
- D. PVC schedule 40 shall not be used exposed or concealed in gypsum wall but may be used in CMU walls. PVC schedule 40 may be used in elevated floor slabs and in foundation slabs. Minimum concrete cover shall be $\frac{3}{4}$ inch at finished or formed surface and shall be 3 inches at concrete surface cast against earth or for slabs placed on-grade. Greater amounts of concrete cover shall be used in areas subject to damage. The placement of conduit in floor slabs must be thoroughly coordinated with the structural design. Potential conflicts with steel reinforcing bars and reductions in net concrete sections are among the issues that must be considered by the structural engineer.

3.6 Underground Raceways

- A. Where conduit is installed under the ground floor slab within the building foundations, schedule 40 PVC conduit shall be used. At the Contractor's option, this installation may consist of galvanized steel conduit encased with three (3) inches of concrete or rigid steel conduit with a minimum of 15 mils of PVC coating. Where thin wall non-metallic conduit is used under the ground floor slab, the elbows and turn out required to turn the raceway up into cabinets, equipment, boxes, etc. shall be of rigid steel.
- B. Branch circuit raceways run underground external to building foundation walls shall be run in raceways installed in accordance with the NEC and shall be of a type approved by the NEC as "suitable for direct burial." Minimum raceway size shall be 1 inch.
- C. All underground raceways shall be identified by underground line marking detectable tape located directly above the raceway at not less than 12 inches below finished grade. Tape shall be permanent, bright-colored, continuous printed, with detectable material tape for direct burial. Printed legend shall be indicative of type of underground line below. Product shall be Damage Prevention Solutions: Tracetape® Detectable Marking Tape or equal.
- D. Raceways run underground internal to building foundation walls shall be of a type and installed by a method approved by the NEC.
- E. Where underground raceways are required to turn up into cabinets, equipment, etc., and on to poles, the elbow required and the stub-up out of the slab or earth shall be of rigid steel.
- F. The raceway system shall not be relied on for grounding continuity.
- G. Where passing through a "below grade" wall from a conditioned interior building space, raceways shall be sealed utilizing fittings similar and equal to OZ/GEDNEY type "FSK" thru-wall fitting with "FSKA" membrane clamp adapter if required.

END OF SECTION 260545

SECTION 262213 DRY TYPE TRANSFORMERS

PART 1 - GENERAL

- 1.1 The Electrical Contractor shall provide dry type transformer(s) of the size and type as shown on the engineering plans.
- 1.2 Transformer(s) shall be manufactured by Square D or approved equivalents by ABB, Siemens, or Eaton.

PART 2 - PRODUCT

- 2.1 Transformer(s) shall be 480-volt delta to 120/208-volt, three (3) phase, four (4) wire "Y" of the size(s) shown. Transformer(s) shall be energy efficiency type. Minimum transformer efficiencies must satisfy efficiencies promulgated within the United States Code of Federal Regulations CFR Title 10 Chapter II Part 431 (Appendix A of Subpart K 2016) commonly referred to DOE 2016 Efficiency Levels.
- 2.2 Transformer shall be insulated with a 220 °C temperature insulation system. Transformer shall be 115 °C temperature rise and floor mounted with vibration isolation pads provided. Transformer shall be capable of carrying a 15% continuous overload, without exceeding a 150 °C rise. Required performance shall be obtained without exceeding the above rise in a 40 °C maximum, 30 °C average ambient temperature. Where floor mounted units are suspended, the type of suspension and vibration isolation shall be as detailed on the plans.
- 2.3 Six 2 1/2% taps, two above and four below normal shall be provided.
- 2.4 The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable Underwriters' Laboratory and National Electric Code standards.
- 2.5 The maximum temperature of the top of the enclosure shall not exceed 50 °C rise above 40 °C ambient.

EXECUTION

- 2.6 Transformer(s) shall be installed in accordance with manufacturer's instructions and in compliance with the National Electric Code.
- 2.7 Make connections to transformer(s) with a minimum of one (1) foot of flexible conduit.

END OF SECTION 262213

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SECTION 262416 PANEL BOARDS AND CIRCUIT BREAKERS

PART 1 - GENERAL

- 1.1 The Electrical Contractor shall provide all panelboards and circuit breakers as shown on the plans in accordance with this specification.
- 1.2 All equipment shall meet UL, NEC and NEMA Standards as applicable to the equipment specified herein.
- 1.3 All panelboards shall be equipped with a main circuit breaker or main lugs as indicated on the drawings.
- 1.4 All panelboards shall be equipped with branch breakers as shown on the drawings.
- 1.5 All panelboards identified on the drawings for use as service equipment shall be so labeled and UL listed for such use.
- 1.6 Full size insulated copper neutral bars shall be included in all panelboards. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection.
- 1.7 A copper ground bus shall be included in all panelboards.
- 1.8 All current-carrying parts of the bus assembly shall be copper with tin plating.
- 1.9 Panelboards shall be labeled with a UL short circuit rating not less than the rating indicated on the drawings.
- 1.10 The word "spare", unless noted otherwise on the panel schedules, shall be a single pole, 20-amp circuit breaker.
- 1.11 The word "space", unless noted otherwise on the panel schedules, shall be for a space in the panelboard for a standard size, single pole circuit breaker.
- 1.12 Terminals for feeder conductors to the panelboard mains and neutral shall be UL listed as suitable for the type of conductor specified. Terminals for branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type of conductor specified.
- 1.13 Sub fed breakers are not acceptable.
- 1.14 Series rated panel boards or breakers are not acceptable.
- 1.15 All NEMA 1 panel boards shall have a hinged trim (Door in Door).
- 1.16 All panelboards shall have breakers, terminals, and Lugs UL approved use with 75°C rated conductors.

PART 2 - PRODUCT

2.1 This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage	=	240	Maximum Branch Circuit	=	100 amps
Amps	=	600	Short Riding Circuit	=	22,000 amps

A. Panelboards shall be Square D Company type NQ (bolt- on) or equivalent by Siemens, Eaton, or ABB.

- B. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type.
- C. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA, UL and National Electrical Code requirements for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Surface mounted cans shall be galvanized and without preformed knockouts.
- D. Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. Door shall be mounted by completely concealed steel hinges. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish.
- E. Panelboard trims shall cover all live parts. Switching device handles shall be accessible.

2.2 This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage	=	480	Maximum Branch Circuit	=	125 amps
Amps	=	600	Short Circuit Rating	=	65,000 amps 480 VAC
				=	100,000 amps 240 VAC

- A. Panelboards shall be Square D Company Type NF (bolt- on) or equivalent by Siemens, Eaton, or ABB.
- B. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type.
- C. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA, UL and National Electrical Code requirements for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Surface mounted cans shall be galvanized and without preformed knockouts.
- D. Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. Door shall be mounted by completely concealed steel hinges. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish.
- E. Panelboard trims shall cover all live parts. Switching device handles shall be accessible

2.3 This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage	=	480	Maximum Branch Circuit	=	1,200 amps
Amps	=	1,200	Short Riding Circuit	=	200,000 amps

- A. Panelboards shall be Square D Company, Type I-Line or equivalent by Siemens, Eaton, or ABB
- B. Panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel are to be as specified in UL Standard 50 for cabinets. The size of wiring gutters shall be in accordance with NEMA, UL and NEC Standards for panelboards. Cabinets are to be equipped with spring latch and tumbler-lock on door of trim. Doors over 48" long shall be equipped with three-point latch and vault

lock. All locks shall be keyed alike. End walls shall be removable. Fronts shall be of code gauge, full finished steel with rust inhibiting primer and baked enamel finish.

- C. The panelboard interior assembly shall be dead front with panelboard front removed. Main lugs or main breaker shall be barriered on five sides. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the bus structure opposite the mains shall be barriered.
- D. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door.

2.4 Molded Case Circuit Breakers

- A. This specification covers molded case circuit breakers rated 15 through 1200 amperes 120VAC, 240VAC, 277VAC and 480VAC. Breakers covered under this specification may be installed in switchboards, panelboards, motor control centers, combination motor starters, busway plugs and individual enclosures.
- B. Circuit breakers shall be manufactured by Square D Company of the size as indicated on the drawings or equivalent by Siemens or General Electric. All breakers shall be bolt-on type.
- C. All circuit breakers shall have a quick-make, quick-break over center toggle type mechanism. The handle mechanism shall be trip-free to prevent holding contacts closed against a short circuit or sustained overload. All circuit breakers shall assume a position between on and off when tripped automatically. Multi-pole circuit breakers shall be common trip such that an overload or short circuit on any one pole will result in all poles opening simultaneously. Arc extinction is to be accomplished by magnetic arc chutes. All ratings shall be clearly visible.
- D. Automatic operation of all circuit breakers shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. Circuit breakers shall be calibrated to carry 100% rated current in an ambient of 40 degrees Celsius. Circuit breakers shall be ambient compensating in that, as the ambient temperature increases over 40 degrees Celsius, the circuit breaker automatically derates itself to better protect its associated conductor. The instantaneous magnetic trip shall be adjustable and accessible from the front of all circuit breakers on frame sizes 250 amps and above.
- E. The interrupting rating of each circuit breaker shall be as indicated on the drawings. The interrupting rating of the circuit breakers shall be at least equal to the available short circuit current at the line terminals of the circuit breaker and correspond to UL listed integrated short circuit current rating specified for the panelboards and switchboards.
- F. UL Class A (5 milliamperes sensitivity) ground fault circuit protection shall be provided on 120 V ac branch circuits as specified on the plans or panelboard schedule. This protection shall be an integral part of the branch circuit breaker which also provides overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard branch circuit space than a conventional single pole circuit breaker.
- G. Motor starters, and other applications as indicated on drawings, shall be furnished with magnetic-only type molded case circuit breakers. Each breaker shall be provided with a single magnetic adjustment that will set all poles to the same trip current. Adjustment shall be continuous throughout the adjustable trip range. The magnetic trips shall be accessible from the front of these circuit breakers.

PART 3 - EXECUTION

- 3.1 Panelboards shall be flush, or surface mounted as shown on the plans.
- 3.2 Panel enclosures shall not be used as junction or pull boxes for splicing conductors.
- 3.3 Each flush mounted panel shall be equipped with two empty one inch conduits sealed in the wall from a panel to a six inch square flush mounted box installed above a lay-in type ceiling or flush in the wall at the ceiling for a plaster or spline type acoustical tile ceiling.
- 3.4 All panels shall be equipped with neatly typed directory cards attached on the inside of the door.
- 3.5 GFI circuits shall be tested by the Contractor prior to the pre-final inspection.
- 3.6 Testing shall be performed by a qualified factory technician at the job site. All readings shall be tabulated by the contractor.
- 3.7 The number of branch circuit shall be identified with permanent wire tag attached to the wire.

END OF SECTION 262416

SECTION 262726 WIRING DEVICES

PART 1 - GENERAL

- 1.1 Switches, dimmer switches, photocell, contactors and receptacles, with proper cover plates, shall be provided where indicated on the Drawings.

PART 2 - PRODUCT

- 2.1 Switches, dimmer switches, photocell, contactors and receptacles shall be as specified in the Symbol Schedule of the Drawings.
- 2.2 All switches and receptacles shall be industrial specification grade or heavy-duty grade meeting NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL-498 and shall be approved third-party listed.
- 2.3 Switches and receptacles shall be as manufactured by Hubbell, Pass and Seymour, or Leviton. Photocells shall be manufactured by Tork, Paragon, Bryant, or equivalent.
- 2.4 Cover plates for all wall mounted devices shall be provided as scheduled on the Drawings. Where covers are not specified, they shall be as follow:
 - A. Interior: unbreakable nylon. Cover plate mounting screws shall be slotted head oval screws and shall match the finish and material of the plate and shall be furnished with the plate by the plate manufacturer.
 - B. Exterior, exposed work and wet locations: cover plates shall be galvanized cast ferrous metal, standard size, and shall be single or ganged as indicated on the drawings. Exterior mounted switch and receptacle plates, and those noted to be weatherproof, shall be weatherproof cover plates, standard size, extra duty rated, single or ganged as indicated on the drawings and shall be "approved" third party listed as "rain-tight while in use."
- 2.5 All devices shall have a hex-head green grounding screw for use in connecting device to green grounding conductor run in the conduit system.
- 2.6 All GFI devices shall be the feed through type.
- 2.7 All standard duplex receptacles shall be 20-amp, 125 volt rated.
- 2.8 All devices subject to use in a wet location shall be listed as weather resistant.
- 2.9 All switches shall be rated 20-amp, 120/277 volt. Toggle switches shall have quiet operating mechanisms without the use of mercury switches.

PART 3 - EXECUTION

- 3.1 Mounting height shall be as indicated on the Drawings. Coordinate with other trades so that devices will miss equipment installed by others.
- 3.2 Where two or more devices are ganged, they shall be in a common box with a ganged plate.
- 3.3 All devices shall have a green ground conductor to run parallel with the phase conductor back to the electrical panel.

- 3.4 In all areas where carpet is to be installed as finished floor material, unless otherwise specified, the Electrical Contractor will furnish solid brass carpet flanges for installation on floor outlet boxes. Flanges will be furnished and installed on all active outlets after the carpet is installed. Where a specified number of outlet fittings are to be furnished to the Owner, for each fitting not installed during the construction period, it will be turned over to the Owner with the receptacle, carpet flange and all necessary appurtenances.
- 3.5 Provide quantity of 2% spare cover plates of each type to the owner.

END OF SECTION 262726

SECTION 262727 DISCONNECTS

PART 1 - GENERAL

- 1.1 Disconnect switches shall be provided where indicated on the drawings, or as required by the National Electrical Code (NEC).

PART 2 - PRODUCT

- 2.1 Disconnects shall be heavy duty as manufactured by Square D Company, Siemens, Eaton, ABB, or approved equivalent.
- 2.2 Disconnects shall be furnished with factory finish paint and appropriate knockouts for conduit connections.
- 2.3 All disconnects shall have side hinged type doors. Front operated handles will not be permitted.
- 2.4 All fused disconnects shall be equipped with positive pressure fuse clips and shall have visible disconnecting blade switches.
- 2.5 NEMA 1 enclosures shall be provided where installed indoors. NEMA 3R enclosures shall be provided where exposed to the elements, unless noted otherwise.
- 2.6 All disconnects shall have copper bus.
- 2.7 Disconnects shall have provisions for locking in on and off positions.
- 2.8 Disconnects shall have defeatable door interlocks that prevent the door from opening when the operating handles is in the “on” position.
- 2.9 Disconnects shall have handles whose positions are easily recognizable in the “on” or “off” position. For safety reasons, padlock shall be provided for switches located in the public areas.

PART 3 - EXECUTION

- 3.1 Disconnect switches shall be mounted as indicated on the Drawings and shall be independently supported. Conduits entering the disconnect switch shall not be used to support switches.
- 3.2 Where fused disconnect switches are required or shown on the plans, standard Fusetron fuses shall be used unless the switch protects an individual motor circuit, then dual element Fusetron fuses shall be used.
- 3.3 The electrical contractor shall provide to the owner the spare fuses, 10% of the quantity of fuses used of each type and rating, with a minimum of one set of each type.

END OF SECTION 262727

SECTION 263100 PHOTOVOLTAIC POWER SYSTEM

PART 1 - GENERAL

1.1 Scope of Work

- A. Install a complete and fully functional photovoltaic system as outlined in the drawings, and in accordance with industry practice and all applicable codes.
- B. At a minimum the system shall consist of the supply and installation of an array of photovoltaic modules, mounting structure, terminal box(es), quick-connect electrical connectors, DC wiring, DC disconnect, grid-connected inverter, ac disconnect, ac wiring, all metering equipment, connected to the grid.
- C. The system shall be designed to meet all local seismic and wind load requirements.
- D. All permits and submittals required by architect, electrical engineer, and permitting authority.
- E. Utility interconnection agreement will be obtained by Pisgah Energy.
- F. Pre and post installation structural letters, if required by the AHJ, are the responsibility of the contractor.

1.2 Qualification

- A. Contractor must have experience installing similar systems and must be capable of completing this project in a timely fashion and with the highest quality.
- B. Installer/contractor must have a NABCEP certified PV installer on the installation crew in a supervisory role.

1.3 Warranties

- A. PV modules shall have a minimum material warranty and a minimum power output guarantee that meets or exceeds the warranty of the make and model specified.

1.4 Quality Assurance

- A. The photovoltaic modules shall be certified by underwriter laboratories (ul) standard 61730 for safety for flat-plate photovoltaic modules. The system shall be comprised of ul listed components in cases where ul listed components are available.
- B. Photovoltaic modules shall be tested in the factory for design performance.
- C. Inverters shall be factory tested for performance, and results shall be included in the O & M manual.
- D. All installations shall meet or exceed OSHA requirements.
- E. All work is to be inspected by the quality assurance team from Pisgah Energy. Contractor will open all electrical panels, and provide photos as requested.

PART 2 - PRODUCTS

2.1 General.

- A. All materials that are used outdoors shall be sunlight and UV resistant.
- B. Materials shall be designed to withstand the temperatures to which they are exposed.
- C. Dissimilar materials should be isolated from one another using non-conductive shims, washers or other methods.
- D. Metals shall be hot dipped galvanized steel or anodized aluminum.
- E. Aluminum shall not be placed in direct contact with concrete materials.
- F. Structural members shall be corrosion resistant aluminum, 6061 or 6063. Structural members shall be permitted to be steel as noted.
- G. All electrical equipment shall be rated for the current and voltage ratings necessary for the application.
- H. All required over-current protection devices will be included in the system and accessible for maintenance. Each shall have trip ratings no greater than the de-rated amperage of the conductor it protects.
- I. Electrical contractor will be responsible for installing expansion joints in conduit runs as needed.

2.2 Mounting Systems

- A. The mounting system shall result in the installation of a PV system that meets all local seismic and wind requirements.
- B. Pitched rooftop systems shall be based on Iron Ridge. Approved alternate manufacturers are AEROCOMPACT, Unirac, Pre-Formed Line Products, and SnapNrack.
- C. Racking roof attachments shall be standing seam clamps. Type and quantity shall be determined by the contractor, sufficient to meet the requirements of this specification and approved by the architect. Contractor to provide stamp on final racking design used for construction by a licensed North Carolina structural engineer.
- D. Contractor shall ensure the racking system to be used for construction is compatible with the mounting requirements for the solar panel used for construction.
- E. Mounting system shall comply with roof manufacturer's requirements for keeping roof warranty intact.
- F. Contractor to provide racking roof layout shop drawings to architect for review and approval prior to installation.

2.3 Inverter

- A. Approved manufacturer for inverter is SolarEdge. Refer to single line drawing for exact specifications. No substitutions will be allowed.
- B. Rooftop inverters must include module level rapid shutdown in accordance with current NEC.
- C. Rooftop inverters must include module level monitoring and module level DC-DC optimization.
- D. The inverter shall have a minimum CEC rated efficiency of 98.5%.

- E. SolarEdge S1201 optimizers shall be used, unless otherwise noted on the plans. Contractor to ensure optimizer is compatible with modules used in construction.
- F. Access to the Solar Edge online monitoring portal shall be provided for the system owner. A monitoring login with full administrative access will also be provided for Pisgah Energy. Monitoring system will be connected to local network via hardwire connection at network wall jack near inverter. Contractor shall install communication cable with ethernet connectors between inverter and wall jack.
- G. All conductors shall be connected to the inverter per the manufacturer's documentation, making note of recommended terminations, torque value, and bolt stack up details if provided. All buss bars, conductors, and termination shall be cleaned prior to making the connection.
- H. Inverters shall be stored per manufacturer's requirements.

2.4 Photovoltaic Modules

- A. Basis of design for PV modules is Q.CELL 490W Q.PEAK DUO XL-G10.3/BFG. Approved alternative manufacturers are REC, TRINA, and Mission Solar.
- B. Bidders shall be responsible for verifying up-to-date documentation from manufacturers are being used.

PART 3 - EXECUTION

3.1 System Electrical

- A. DC series string home-run circuits must pair connectors that match exactly to what is installed on the modules. No "compatible" labeled connectors permitted. Original warranty and listing from the connector manufacturer must be maintained.
- B. Adapter interconnects shall be provided where applicable to match connectors between modules and DC optimizers, should connectors not match.
- C. Conductors shall be installed so that no connectors are exposed to standing water.
- D. On the direct current side, all wiring shall be listed for at least the maximum operating voltage of the DC system and temperature rating of 90°C wet locations. All current carrying conductors shall be enclosed in conduit/raceway, excluding module interconnections and connections from individual module strings to the rooftop combiner or junction box within the array boundary.

3.2 Raceway

- A. See section 260545 Conduit and Conduit Fittings.
- B. Provide 'pv source circuit' labels on conduit every 10 feet as required per code.

3.3 Boxes and Cabinets

- A. See section 260533 Boxes and Cabinets.
- B. Contractor to provide detailed shop drawings of rooftop J-box and rooftop conduit penetrations including locations, size of holes, and roof flashing specifications.

3.4 Conductors:

- A. See section 260520 Wires and Cables.
- B. DC circuit wiring:
 - 1. All DC conductors shall be copper PV wire, rated 90°C wet/dry except where otherwise noted or required by UL or other codes. All DC conductors shall be PV wire stranded for #10 AWG.
 - 2. DC conductors shall be color coded red/black/green for positive, negative, and ground, respectively.
 - 3. PV system DC circuit conductors shall be identified at all accessible points of termination, connection, and splices as required per NEC 690.31(B)(1).
 - 4. Splices in #10 AWG and smaller shall be made up with crimped connectors with insulating caps (no tape) or wrenuts (maximum of 3 conductors under any connector or wrenut). Larger wire shall use split bolts or bolted clamps.
 - 5. Wrenuts are only allowed for auxiliary circuits. If used, all wrenuts are to be silicone filled, equivalent to ideal blue, and installed per manufacturer's specifications by a qualified/certified person. Wrenuts shall not be installed along the path of PV power generation, or for any equipment necessary for the generation of PV power.
 - 6. Circuit splices shall not be made on device terminals.
 - 7. Current limiters shall be provided where the PV disconnect and point of interconnection are separated by a distance greater than 16.5 feet, in accordance with NEC 705.11(C).
 - 8. All DC materials shall be ul listed for at least the maximum DC system voltage.
 - 9. Exposed single conductor PV wire will be allowed within array boundary for PV source and DC-DC converter circuits. Wire management methods shall be provided such that wires are neatly trained along module frames or rack framing members. Wires shall be supported every 24" at a minimum using metal clips, hangers, or coated stainless steel cable ties specifically for PV wire management applications. UV stabilized plastic cable ties listed to UL standard 21s shall be permitted as a supplement, but shall not be used as the primary means of wire management.
 - 10. No wires shall be in contact with roof surface. Where wires are exposed between modules on a tilt/ballasted rack, they shall be protected from physical damage by conduit sleeve or other approved method.

3.5 Markings

- A. All interactive system points of interconnection with other sources shall be marked at an accessible location at the disconnection means.
- B. A permanent plaque or directory shall be provided identifying each power source disconnection means, if not located at the same location, per NEC 705.10.
- C. Photovoltaic modules shall be marked to identify lead polarity, device ratings, and specifications for voltages, currents, and power.
- D. Required safety signs and labels shall be permanently attached by adhesive, or other mechanical means. Labels shall comply with article 690 of the NEC or other applicable state, and utility codes.

3.6 Installation Standards

- A. The installation shall be completed with the minimum of impact on the environment.
- B. System installation shall conform to manufacturer's installation manuals and approved project drawings and specifications.
- C. Array mounting hardware shall be compatible with the site considerations and environment. Special attention shall be paid to minimizing the risk from exposed fasteners, sharp edges, and potential damage to the module or support structures. Corrosion resistance and durability of the mechanical hardware shall be emphasized. The use of ferrous metals, woods, or plastic components is not acceptable.
- D. Any rooftop penetration must be installed and sealed with the roofing manufacturer's requirements for keeping roof warranty intact.

END OF SECTION 263100

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SECTION 265100 LIGHTING FIXTURES

PART 1 - GENERAL

- 1.1 The Contractor shall provide all fixtures and lamps where indicated on the Drawings.
- 1.2 Work shall include all stems, canopies and accessories necessary for a complete lighting fixture installation.
- 1.3 No PCB ballasts shall be accepted.
- 1.4 All lighting systems shall comply with the 2012 North Carolina State Energy Code.

PART 2 - PRODUCT

- 2.1 Fixtures shall be as specified in the Fixture Schedule or approved equivalents.
- 2.2 All outdoor fixtures shall bear the approved third-party test label for damp or wet locations as applicable. Where the ambient temperature falls below 35°F all LED fixtures and drivers shall be rated for operation at 0°F.
- 2.3 Unless otherwise noted, all fixtures shall be new, free of defects and imperfections. Damaged fixtures shall be replaced at this Contractor's expense.
- 2.4 All acrylic lenses for lay-in troffers and wrap around fixtures shall have a nominal lens thickness of 0.125" unless noted otherwise on plans.
- 2.5 LED Luminaries:
 - A. LED driver manufacturers should have a minimum of five years of experience with the manufacture of LED drivers. All drivers shall have a minimum warranty of five years.
 - B. Fixtures shall be dimmable down to 1% with standard 120/277-volt, electronic, low voltage dimmers.
 - C. Minimum color rendering index (CRI) shall be 80. Color temperature and performance shall conform to the parameters established by ENERGY STAR SSL standards (refer to ANSI-C78.377-2008).
 - D. Optical design shall be low glare, 50% cut-off.
 - E. Rated for 50,000 hours at 70% lumen maintenance.
 - F. LED driver shall be high efficiency with a minimum power factor of .90
 - G. 5-year, 100% warranty coverage for the driver, LED module, housing and trim. For the 1st year this shall be a complete parts and labor warranty. The 4th and 5th years shall cover parts only.
- 2.6 Emergency Exit Lights

It shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, N.C. Building Code, Energy Code, NFPA-101, and NEMA Standards.

A. Battery

It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive terminal and – negative terminal.

B. Charger

It shall be fully automatic solid-state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80 percent. A low voltage disconnect switch shall be included if LEAD Battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

C. Additional Features

Pilot light to indicate the unit is connected to AC power. The battery shall have high rate charge pilot light, unless self-diagnostic type. A test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer rely.

D. Warranty

The entire unit shall be warranted for three years. The battery must have an additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

E. LED

The use of LED is required due to their reliable performance, low power consumption, and limited maintenance requirements. Maximum LED failure rate shall be 25% within a seven (7) year period; otherwise, if exceeded, manufacturer shall replace the complete unit at no charge to the owner.

F. Unit Test

Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes, in accordance with NEC 700. The battery test shall be done 10 days prior to final inspection. Any unit which fails the test must be repaired or replaced and tested again. Copy of the test report shall be made available for the owner and engineer.

PART 3 - EXECUTION

- 3.1 All fixtures shall be installed in accordance with the National Electric Code.
- 3.2 All fixtures other than the lay-in type shall be individually supported from building structure with 1/4" threaded rods and nuts.
- 3.3 Where a recessed or downlight fixture replaces a section or part of a ceiling tile, fixture is to be supported at the two (2) opposite ends to the steel frame of the building. Supports shall be provided with the same type of wire as used to support the lay-in ceiling track. Attach one end of the wire to one corner of the luminaire and the other end to the building's structural system. For fire rated suspended ceiling, luminaire shall be supported to the Building Structure as per the Ceiling Design Criteria.
- 3.4 The complete emergency lighting system shall be tested by throwing the circuit breakers feeding the emergency lighting circuits. One and one-half hours thereafter, the battery voltages shall be recorded in a

report to be submitted to the Engineer. This test shall be performed just prior to final inspection, under witness of the electrical inspector, and in accordance with NEC Articles 700.3 (A) and (D).

END OF SECTION 265100

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SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Standards set forth by the North Carolina Department of Environmental Quality (NCDEQ) Division of Energy, Mineral and Land Resources.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Removal of trees and other vegetation.
 - 2. Clearing and grubbing.
 - 3. Removing above-grade improvements.
 - 4. Removing below-grade improvements.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving".
 - 2. Division 31 Section "Erosion Controls".

1.3 PROJECT CONDITIONS

- A. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.
- B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
 - 1. Protect improvements on adjoining properties and on Owner's property.
 - 2. Restore damaged improvements to their original condition, as acceptable to property owners.
 - 3. All erosion control measures shall be in place prior to commencement of clearing operations.
- C. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
 - 1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
 - 2. Provide protection for roots over 1-1/2 inch (38 mm) in diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt or other acceptable coating formulated to use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
 - 3. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations in a manner acceptable to Engineer. Employ a licensed arborist to repair damage to trees and shrubs.
 - 4. Replace trees that cannot be repaired and restored to full-growth status, as determined by arborist.

- D. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated or directed.

1.4 EXISTING SERVICES

- A. General: Indicated locations are approximate; determine exact locations before commencing Work.
- B. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Notify affected utility companies in advance and obtain approval before starting this Work.
- C. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

PART 2 – PRODUCTS

None Used.

PART 3 – EXECUTION

3.1 SITE CLEARING

- A. General: Remove trees, shrubs, grass, and other vegetation, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site removal of stumps and roots.
 - 1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 2. Existing trees within clearing limits may be chipped and stockpiled on-site but shall NOT be used as landscaping mulch or fill.
- B. Clearing and Grubbing: Clear site of trees, shrubs, and other vegetation, except for those indicated to be left standing.
 - 1. Completely remove stumps, roots, and other debris protruding through ground surface.
 - 2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
 - 3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - a. Place fill material in horizontal layers not exceeding 6 inches (150 mm) loose depth, and thoroughly compact each layer to a density equal to adjacent original ground.
- C. Topsoil Stripping: Strip and stockpile existing topsoil within construction limits for re-spreading. Should the Contractor elect to remove topsoil from the site, suitable topsoil from off-site sources shall be provided for re-spreading at no cost to the Owner.
 - 1. Remove sod and grass before stripping topsoil.
 - 2. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials. All surface topsoil, regardless of thickness encountered, shall not be considered Unsuitable Soil.
 - 3. Remove subsoil and non-soil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
 - 4. Stockpile topsoil materials within construction limits and away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 5. Do not stockpile topsoil within tree protection zones.
 - 6. Dispose of excess topsoil off-site.

- D. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.
 - 1. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings and is included under work of related Division 22 Sections. Removing abandoned underground piping or conduits interfering with construction is included under this section.

3.2 DEMOLITION PREPARATION

- A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations or as shown on the drawings.
- B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective site demolition area.
 - 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction or as shown on the plans.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 4. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.
- C. Provide and maintain exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.
- D. Protect trees, fences, poles, mailboxes, and all other property unless their removal is authorized. Any property damaged, that is not authorized for removal, shall be restored or replaced to the Owner's satisfaction.

3.3 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during selective site demolition operations.
 - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
 - a. Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover.
- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.

- C. Utility Requirements: Refer also to Division 15 and 16 Sections for additional requirements for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective site demolition work until utility disconnecting and sealing have been completed and verified in writing.
- D. Utility Adjustments and Relocations: Adjust locations, elevations and routes of existing utility lines, poles, guys, vaults, handholes, boxes, and other related appurtenances as required to facilitate new construction. Coordinate adjustments and relocations with utility companies.

3.4 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
 - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective site demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.5 SELECTIVE SITE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated on the drawings. Use methods required to complete Work within limitations of governing regulations.
 - 1. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
 - 2. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
- B. Demolish asphalt, concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools.
- C. Remove sawcut concrete and asphalt, including aggregate base, to a depth of 12-inches below existing, adjacent grade, or as indicated. Provide neat sawcut at limits of pavement removal as indicated.

3.6 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective site demolition operations.
- B. Where repairs to existing surfaces are required, match previous work as closely as possible.
 - 1. Completely fill holes and depressions in existing masonry walls to remain with an approved masonry patching material, applied according to manufacturer's printed recommendations.
- C. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

3.7 CLEANING

- A. Keep the site free from debris and hazards and inspect the site at the end of each day for trash. All adjacent roads and drives outside of the construction fencing shall remain in operation during construction and shall remain free of all construction materials and debris.

3.8 DISPOSAL OF WASTE MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning on Owner's Property: Burning is not permitted on Owner's property.
- C. Removal from Owner's Property: Remove waste materials and unsuitable or excess soils and mulch from Owner's property. Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 311000

SECTION 312000 – EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Report of Subsurface Investigation.
 - 1. The geotechnical report is available to bidders as general information with regard to project and site conditions. However, the geotechnical report is not a part of the contract documents and is not a warranty or guarantee of subsurface conditions. Variations in subsurface conditions should be anticipated. Bidders should carefully inspect the site prior to bidding and will be provided reasonable access to perform independent explorations of subsurface conditions, if requested.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Preparing and grading subgrades for building pads, pavements, walks, lawn areas, and landscaping.
 - 2. Excavating, filling and backfilling for structures.
 - 3. Base course for walks and pavements.
 - 4. Subsurface drainage backfill for trenches.
 - 5. Excavating and backfilling trenches.
 - 6. Porous fill course below building slabs-on-grade.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Division 01 Sections for allowances, definitions and procedures.
 - 2. Division 31 Section "Site Clearing" for site stripping, grubbing, topsoil removal, and tree protection.
 - 3. Division 33 Section "Storm Drainage Utilities" for storm drainage.
 - 4. Division 32 Section "Planting" for finish grading, including placing and preparing topsoil for permanent and temporary grass seeding.
 - 5. Division 31 "Erosion and Sediment Controls", for all areas of the site that are graded or disturbed by any construction operations

1.3 UNIT PRICES

- A. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following:
 - 1. 24 inches outside of concrete forms other than at footings.
 - 2. 12 inches outside of concrete forms at footings.
 - 3. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - 4. 6 inches beneath bottom of concrete slabs on grade.
 - 5. 6 inches beneath invert elevation of pipe in trenches and 12 inches wider than pipe outside diameter.
 - 6. Additional rock removed beyond the limits outlined above to accommodate trench boxes, other removal methods, compaction equipment or other reasons shall not be included in the payment volume.
 - 7. Any materials paid by Unit Prices to replace excavated rock shall utilize these same measurement limits.

- B. Unsuitable Soil Measurement: Volume of soil actually removed, measured in original position, but not to exceed the limits directed by the Owner’s Independent Testing Agency.
 - 1. Additional soil excavated beyond the limits directed by the Owner’s Independent Testing Agency; including lay-back of excavation walls, excavation to accommodate trench boxes or other shoring, etc.; shall not be considered Unsuitable Soil.
- C. Replacement Material Measurement: Volume exactly equal to that of the unsuitable soil or rock that was removed, measured in original position.
- D. Unit prices for unsuitable soil and rock removal shall include all work and materials as defined in Division 01 sections.

1.4 DEFINITIONS

- A. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed. Refer to the following section for additional definitions of classified excavations.
- B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below base course, drainage fill, or topsoil materials.
- C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- D. Surface Course: The top layer of the pavement structure placed on base course or subgrade.
- E. Base Course: Layer placed between the subgrade elevation and asphalt paving courses.
- F. Bedding Course: Layer placed over excavated subgrade in a trench before laying pipe.
- G. Porous Fill Course: Layer placed below building slab-on-grade.
- H. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- J. Structural Areas: Areas containing Structures and pavement and extending 10-ft beyond the limits of structures and pavements. Structural Areas in fill shall also include the area supporting the fill slope along a 1:1 slope to existing grade. Pavement areas include but are not limited to roads, driveways, parking lots, curbs, sidewalks, dumpster pads, equipment pads, concrete pads, tracks, tennis courts, and other similar above grade improvements.
- K. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.5 EXCAVATION CLASSIFICATIONS

- A. Excavation Classifications: All excavation is classified as General Excavation except for Mass Rock, Trench Rock and Unsuitable Soil Materials as defined in this section.
 - 1. General Excavation: Excavation, removal and/or disposal of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished

and/or removed; together with soil, boulders, and other materials encountered that are not classified as rock, unsuitable soil, or unauthorized excavation.

- a. Intermittent drilling, blasting, or ripping to increase production and not necessary to permit excavation of material encountered will be considered general excavation.
 - b. Soil (regardless of nature) or other debris encountered above proposed subgrade elevations shall be considered general excavation unless determined by the Architect to meet the definition of rock.
 - c. In-place densification of existing soils at exposed subgrades, as described herein, shall be considered General Excavation.
2. Unsuitable Soil Excavation: Removal and disposal of soil materials or other debris encountered below proposed subgrade elevations which is deemed unsuitable to remain in place by the Architect or Owner's Independent Testing Agency.
- a. Soil and/or other debris encountered above proposed subgrade elevations shall be considered general excavation.
 - b. Soil material which, in the opinion of the Architect or Owner's independent testing agency, can be repaired by scarifying, drying and recompacting or material which is made unsuitable by delay of work, lack of protection or other actions of the Contractor or his Sub-Contractors shall not be considered as unsuitable soil and shall be repaired or replaced by the Contractor at no additional cost to the Owner. Moisture content alone shall not be the determining factor as to the presence of unsuitable soil.
 - c. Any material moved or removed without the measurement by the Owner's independent testing agency and approval by the Architect will be considered as general excavation.
 - d. Surface topsoil, regardless of thickness encountered, shall not be considered unsuitable soil.
 - e. Stones, rocks and boulders not meeting classifications of rock shall not be considered unsuitable soil. Stones, rocks and boulders shall be removed from soil as necessary if soil is to be used as fill or backfill. Removed stones, rocks and boulders shall be removed from the site.
 - f. The unsuitable soil allowances shall be for unsuitable soils only and not for repair of weather related deterioration of subgrade. These Allowances are not for required on-site cut and off-site fill necessary to bring subgrades and grades to elevations shown on drawings. Contractor shall be responsible for proper drying and dewatering procedures, as necessary, as part of his normal operations.
3. Mass rock Excavation: Removal, in Open Excavations, of rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1.5-cu.yd. that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted. In the event rock (as defined above) is encountered, the Contractor shall immediately notify the Architect.
- a. Mass Rock Excavation Equipment: Late-model, track-type CAT D-8 crawler tractor operating at one mile per hour in the lowest available gear, and at the highest normal operating rpm pulling a sharp, single-toothed ripper. The Contractor shall provide equipment specification and test data verifying that the equipment to be used for demonstration purposes complies with the minimum requirements. The equipment shall be in good repair and in proper working condition. The Owner reserves the right to inspect and approve the equipment to be used for demonstration purposes. The Contractor shall demonstrate (at no additional cost) to the Architect or Owner's independent testing agency that the rock cannot be practically ripped with equipment equivalent that specified above without systematic drilling and blasting. Mass rock is defined as material which, after 1 hour of continuous ripping using the equipment described above, produces less than 30 cubic yards of removable material.

4. Trench Rock Excavation: Removal, in Trench Excavations, of rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1.0-cu.yd. that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted. In the event rock (as defined above) is encountered, the Contractor shall immediately notify the Architect.
 - a. Trench rock excavation equipment: Late-model, track mounted CAT 330 or equivalent hydraulic excavator equipped with a narrow (36" max) bucket with new rock teeth and operating at the highest normal operating RPM. The Contractor shall provide equipment specification and test data verifying that the equipment to be used for demonstration purposes complies with the minimum requirements. The equipment shall be in good repair and in proper working condition. The Owner reserves the right to inspect and approve the equipment to be used for demonstration purposes. Trench rock is defined as material which, after 1 hour of continuous digging using the equipment described above, removes less than 10 cubic yards of material.
5. Classified excavation requirements:
 - a. Excavations more than both 10 feet in width and more than 30 feet in length are defined as Open Excavations. Excavations less than both 30 feet in width and less than 30 feet in length are defined as Trench Excavations.
 - b. Contractor shall expose and clean the rock material for inspection and measurement by the Architect.
 - c. Do not excavate rock or unsuitable soil until it has been classified and cross-sectioned by the Owner's independent testing agency or Architect. Any material moved or removed without the measurement by the Owner's independent testing agency and approval by the Architect will be considered as General Excavation.
 - d. The Architect shall be the final judge on what is classified as unsuitable or rock excavation.
 - e. The contractor may be required to provide equipment specification data verifying that the above minimum-rated equipment will be used for demonstration purposes. The equipment shall be in good repair and in proper working condition.
 - f. Rippable rock, weathered rock or overburden which is not classified as rock according to the above definitions shall be considered General Excavation.

1.6 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Test Reports: In addition to test reports required under field quality control, submit the following:
 1. Laboratory analysis of each soil material proposed for fill and backfill from on-site and borrow sources.
 2. One optimum moisture-maximum density curve for each soil material.
 3. Reports of all laboratory and field tests including evaluations of subgrades and foundation bearing conditions.
 4. Reports of Testing and Inspection Agency.
- C. Blasting plan approved by authorities having jurisdiction if applicable due to on-site rock.
- D. Report of rock or unsuitable soil removal with quantities confirmed in writing by the Architect or Owner's independent testing agency.

1.7 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction. Any earthwork required for preparation of parking areas and drives shall comply with current NCDOT Standard Specifications as per the North Carolina Construction Manual.
- B. Comply with applicable requirements of NFPA 495--Explosive Materials Code.
- C. Testing and Inspection Service: Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.
- D. Testing and Inspections: Owner will employ a qualified Testing and Inspection Agency to perform verification and inspection of earthwork construction in accordance with NC State Building Code.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1
 - 1. Before commencing earthwork, meet with representatives of the governing authorities, Owner, Architect, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.8 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Architect and then only after acceptable temporary utility services have been provided.
 - 1. Provide a minimum 48-hours' notice to the Architect and receive written notice to proceed before interrupting any utility.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.

1.9 PAYMENT

- A. General Excavation: All general excavation to the lines and grades indicated on the drawings including all necessary off-site disposal of excess materials and/or off-site borrow of fill materials shall be included in the base bid.
 - 1. No statement is made or implied that the on-site grading and earthwork indicated on the drawings is balanced.
- B. Unsuitable Soil Material Excavation: Unsuitable soil material excavation will be paid by unit prices included in the Contract Documents.
 - 1. Unused amounts of monies included under allowances shall be credited to the Owner by deduct change order.
- C. Rock Excavation: Mass rock and Trench rock excavation will be paid by unit prices included in the Contract Documents.
 - 1. Unused amounts of monies included under allowances shall be credited to the Owner by deduct change order.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.
- B. Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GC, GP, GM, ML, CL, SW, SP, SC, and SM; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter; with a Plasticity Index 26 or less and a Liquid Limit less than 50.
 - 1. Soils placed in structural fill areas shall have a standard Proctor maximum dry density of at least 90-pcf.
 - 2. Soils free of organics and having a plasticity index greater than 26 and a liquid limit greater than 50 may be used as fill in approved non-structural areas.
 - 3. Satisfactory soil materials obtained from off-site borrow sources shall meet all requirements listed in paragraph B above, however Plasticity Index shall be less than 20, shall contain at least 20% fines and have a standard Proctor maximum dry density of at least 90-pcf.
- C. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups MH, CH, OL, OH, and PT. Soils having a Plasticity Index greater than 20 and a Liquid Limit greater than 50 are also unsatisfactory within structural (pavement and building) areas except if placed as specified above.
- D. Unsuitable Soil: Refer to paragraph 1.5 of this Section.
- E. Backfill and Fill Materials: Satisfactory soil materials.

2.2 PROCESSED AGGREGATE MATERIALS

- A. Base Course Material: Type A aggregate base course meeting the requirements of Section 520 of NCDOT “Standard Specifications for Roads and Structures.”
- B. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- C. Bedding Material: #57 washed stone.
- D. Drainage Fill: #57 washed stone.
- E. Filtering Material: #57 washed stone.

2.6 ACCESSORIES

- A. Drainage (Filter) Fabric: Woven monofilament filtration geotextile, specifically manufactured as a drainage geotextile; made from polypropylene yarns; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods.
 - 1. Tensile Strength: 200 lb; ASTM D 4632.
 - 2. Tear Strength: 60 lb; ASTM D 4533.
 - 3. CBR Puncture: 700 lb; ASTM D 6241.
 - 4. Water Flow Rate: 18 gpm per sq. ft.; ASTM D 4491.
 - 5. Apparent Opening Size: No. 70; ASTM D 4751
 - 6. Percent Open Area: 4%; CW-02215
- B. Separation/Stabilization Fabric: Woven geotextile, specifically manufactured for use as a separation and or stabilization geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
 2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
 3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
 4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
 5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.
- C. Biaxial Geogrid: Integrally formed biaxial geogrid, specifically manufactured for use as a base reinforcement for subgrade improvement. Tensar BX1100, Mirafi BXG-110, or approved equal with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
1. Aperture Dimensions: 1-in (25-mm) nominal.
 2. Minimum Rib Thickness: 0.03-in (0.76-mm) nominal.
 3. Tensile Strength @ 2% Strain: 280-lb/ft (4.1 kN/m); ASTM D-6637.
 4. Tensile Strength @ 5% Strain: 580-lb/ft (8.5 kN/m); ASTM D-6637.
 5. Ultimate Tensile Strength: 850-lb/ft (12.4 kN/m); ASTM D-6637.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- D. Site Maintenance: The Contractor shall be responsible to take whatever measures are necessary to ensure reasonable accessibility to and on the construction site so that undue delays are avoided under normal weather conditions. These measures shall include, but not be limited to, the following:
 1. Maintaining the surface of the soils in a manner to promote drainage runoff and avoid ponding of water, especially prior to predicted rain events.
 2. Avoiding operation of temporary water sources or hoses in a manner which will cause unnecessary and repeated wetting of the site.
 3. Fill in severely rutted areas which are ponding water during the construction activities or after rain events with drainage fill material to assist drying and allow construction activities to continue.
 4. Provide drying of surface soils and soils intended for filling or backfilling as required to promote accelerated drying of those materials.
 5. After successful drying efforts or prior to predicted rain events, grade the areas back to a smooth condition to promote drainage runoff.
 6. Controlling vehicular traffic, both construction and personal on the site in a manner to prevent undue damage to soils whenever possible and practical.
 7. Providing temporary staging areas of crushed stone or other materials around the construction site which will better withstand the weather and traffic and keep the site accessible immediately or shortly after rain events.
 8. Provide de-watering equipment for any areas collecting water which may affect construction or soil densities under built areas.
 9. Any claims for weather related delays considered shall be considered with particular attention paid to the Contractor's efforts in regard to the above requirements

3.2 DEWATERING

- A. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system to keep subgrades dry and convey groundwater away from excavations. Maintain until dewatering is no longer required.
- C. Design, furnish, install, test, operate, monitor, and maintain temporary dewatering systems of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
 - 1. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls as needed.
 - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
 - 3. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
 - 4. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 5. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 6. Remove dewatering system when no longer required for construction.
- D. Soft wet soils, if present at the surface, shall be dried and compacted in place by the Contractor and be stable under proofrolling prior to placing fill. Drying shall be accomplished by discing, plowing or other means necessary and shall be included in the Contractor's bid. Site soils are typical of the area and susceptible to loss of strength if they become wet, resulting in softening and rutting during construction. Site soils are extremely moisture sensitive, therefore, the Contractor shall take active and aggressive steps to dry soil materials wet of optimum to maintain construction progress through the work and to maintain access to and around the construction. The Contractor, at his option and cost may remove unstable, wet materials and replace with available fill materials in lieu of accomplishing soil drying procedures.

3.3 EXPLOSIVES

- A. Explosives shall not be used.

3.4 STABILITY OF EXCAVATIONS

- A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations. Contractor is responsible for ensuring all excavation operations and other construction comply with applicable OSHA requirements. Contractor shall provide temporary shoring and bracing as needed to construct the proposed improvements and comply with the above requirements.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
- B. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated slopes, lines, depths, and invert elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: As indicated
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.
 - 1. For pipes or conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 - 3. Where encountering rock or another unyielding bearing surface, carry trench excavation 6 inches (150 mm) below invert elevation to receive bedding course.
- D. Soil excavated from trenches that is to be used as backfill or fill shall be moisture conditioned as needed prior to placement and compaction as backfill or fill.

3.8 APPROVAL OF SUBGRADE PRIOR TO PLACING FILL OR OTHER IMPROVEMENTS

- A. Notify Architect or Owner's independent testing agency when excavations have reached required subgrade.
- B. After stripping is complete the exposed subgrade shall be proofrolled with a fully loaded dual wheel tandem axle dump truck or similar construction equipment. Four passes shall be made in each orthogonal direction. The proofrolling operation shall be observed by the Architect or Owner's independent testing agency. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the soil shall be scarified and moistened or aerated and recompacted and/or densified in-place. Repeat proofrolling operations.
- C. When Architect or Owner's independent testing agency determines that unforeseen unsuitable soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 - 1. Unforeseen additional excavation and replacement with suitable material approved by the Architect will be considered unsuitable material and will be paid by unit prices included in the Contract Documents. Refer to Division 1 Sections.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect. Install french drains at design subgrade if directed by the Owner's independent testing agency and approved by the Architect.

3.9 IN-PLACE DENSIFICATION OF EXISTING SOILS

- A. After removing the existing buildings, vegetation and pavements, and/or excavating, the entire bearing surface of the proposed building area shall be densified in-place with be compacted with a jumping-jack

style compactor or a trench roller to improve the support of the exposed subgrade soils. Four passes shall be made in each orthogonal direction. Densification shall be performed during dry weather. The densification operations shall be observed by the Owner's independent testing agency.

3.10 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Architect.
 - 1. Fill unauthorized excavations under other construction as directed by the Architect or the Owner's independent testing agency.
- B. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Architect.

3.11 STORAGE OF SOIL MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.12 BACKFILL

- A. Backfill excavations promptly, but not before completing the following:
 - 1. Acceptance of construction below finish grade including, where applicable, damp-proofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for record documents.
 - 3. Testing, inspecting, and approval of underground utilities.
 - 4. Concrete formwork removal.
 - 5. Removal of trash and debris from excavation.
 - 6. Removal of temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
 - 8. Removal of objectionable materials, including rocks larger than acceptable size, from backfill soils.

3.13 UTILITY TRENCH BACKFILL

- A. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. Pipe sleeves and concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches (450 mm) of footings. Place concrete to level of bottom of footings. Contact the Architect or the Owner's independent testing agency to coordinate details, procedures and possible alternatives.
- C. Provide 4 inch (100 mm) thick concrete base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway base course.
- D. Place and compact initial backfill of satisfactory soil material or base course material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
2. Moisture condition soil materials as needed prior to placement as backfill.

E. Coordinate backfilling with utilities testing.

F. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.

G. Place and compact final backfill of satisfactory soil material to final subgrade.

H. Install detectable warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.14 FILL

A. Preparation: Remove vegetation, topsoil, debris, wet, frozen, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.

1. Plow, strip or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.

B. Obtain approval of subgrade as specified prior to placing fill.

C. Obtain approval of fill materials. Remove all objectionable materials, including stones larger than acceptable size, from fill materials.

D. Place fill material in layers to required subgrade elevations for each location listed below.

1. Under grass, use satisfactory excavated or borrow soil material.
2. Under walks, pavements, buildings and other structural areas use base course material, or satisfactory excavated or borrow soil material.

E. Following placement of fill the subgrade of building and pavement areas shall be proofrolled as described in the Field Quality Control section. The proofrolling operation shall be observed by the Owner's testing agency. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the soil shall be scarified and moistened or aerated and recompacted. Repeat proofrolling operations.

3.15 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.

a. Stockpile or spread and dry removed wet satisfactory soil material.

3.16 COMPACTION

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure.

- C. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D698 Standard Proctor:
 - 1. Under structures, steps, walks, and pavements:
 - a. Compact each layer of backfill or fill material at 95% of the standard Proctor Density (ASTM D-698).
 - b. Moisture content of the fill during placement shall be kept within +/-2% of optimum.
 - 2. Under lawn or unpaved areas, compact the top 6 inches below subgrade and each layer of backfill or fill material at 90 percent maximum dry density.
 - 3. Compact each layer of aggregate base material under pavement to 100% density in accordance with AASHTO T-180 as modified by NCDOT or to at least 98% of the nuclear target density as specified in section 520 of the NCDOT Standard Specifications for Roads and Structures.

3.17 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between existing adjacent grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1.2 inches (0.10 foot).
 - 2. Walks: Plus or minus 1.2 inches (0.10 foot).
 - 3. Pavements: Plus or minus 1/2 inch (0.05 foot).
 - 4. Building Pads: Plus or minus 1/2 inch (0.05 foot).
- C. Lawn Area Fine Grading: Finish grade lawn areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1/2 inch in any dimension, and other objects that may interfere with planting or maintenance operations.

3.18 SUBSURFACE / FOUNDATION DRAINAGE

- A. Drainage Piping: Drainage pipe is specified in Division 33 Section "Site Storm Drainage Utilities."
- B. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a course of drainage fill material on drainage fabric to support drainage pipe. Encase drainage pipe in drainage fill material and wrap in drainage fabric, overlapping sides and ends at least 6 inches.
 - 1. Compact each course of drainage fill material.
 - 2. Place satisfactory excavated or borrow soil material or topsoil fill material (as appropriate) over drain to final grade.

3.19 BASE COURSES

- A. Under pavements, walks, courts and tracks, place base course material on prepared subgrades.
 - 1. Where indicated, place biaxial geogrid directly on prepared subgrade under all asphalt and concrete pavement without wrinkles or folds. Seams shall be overlapped a minimum of 12-in. Geogrid placement shall be observed by the Owner's Independent Testing Agency prior to covering. Place compacted base course over geogrid and control traffic and operation of equipment over geogrid and base course in accordance with manufacturer's instructions.

2. Compact base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 100 percent density in accordance with AASHTO T-180 as modified by NCDOT or to at least 98% of the nuclear target density as specified in section 520 of the NCDOT Standard Specifications for Roads and Structures.
 3. Shape base course to required crown elevations and cross-slope grades.
 4. When thickness of compacted base course is 6 inches or less, place materials in a single layer.
 5. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.
 6. Following compaction testing and within 48 hours prior to the application of asphalt or concrete pavement, the aggregate base course shall be proofrolled with a fully loaded dual wheel tandem axle dump truck or similar construction equipment. Four passes shall be made in each orthogonal direction. The proofrolling operation shall be observed by the Architect or Owner's independent testing agency. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the base course shall be scarified and moistened or aerated and recompacted. Repeat proofroll testing.
- B. Pavement Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders at least 12 inches (300 mm) wide of acceptable soil materials and compact simultaneously with each base course layer.

3.20 FIELD QUALITY CONTROL

- A. Owner's Independent Testing Agency Services: Allow testing agency to evaluate and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
1. Perform testing and evaluation of borrow or fill soils for compliance with material specifications of this Section.
 2. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D6938 (nuclear gauge method) or equal as determined by the Owner's independent testing agency.
 - a. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2,500 sq. ft. or less of building slab, but in no case fewer than three tests.
 - b. Paved Areas: At subgrade and at each compacted fill, backfill layer, and aggregate base course layer, perform at least one field in-place density test for every 2,500 sq. ft. or less of paved area, but in no case fewer than three tests. Observe proofrolling of finished subgrade and aggregate base course.
 - c. Trench Backfill: Perform at least one field in-place density test per 2 feet of backfill per 100 linear feet or less of trench outside of limits of buildings, but no fewer than two tests per trench per day.
 - d. Trench Backfill in Building Areas: At each compacted initial and final backfill layer, at least one test for every 50 feet or less of trench length, but no fewer than two tests
 - e. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 50 feet or less of wall length, but no fewer than two tests.
 - f. Non-Structural Areas: Field density and moisture content tests shall be performed on the fill and backfill at a rate of at least one test per every 15,000 square feet of area being filled.
 4. Observe proof-rolling and subgrade densification as described herein.
 5. All site stripping and proofrolling operations shall be observed and monitored. Verify suitability of subgrade prior to installation of fill.
 6. At footing subgrades, test each soil stratum to verify design bearing capacities. Verification and approval of footing subgrades may be based on a comparison of subgrade with test data. Perform additional testing as necessary.
- B. Allow Inspector to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

- C. When subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- E. Additional testing performed to determine compliance of corrected work with specified requirements shall be at Contractor's expense.
- F. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained. Contractor shall be responsible for all costs associated with re-testing required due to failed compaction.
- G. Proofrolling: Subgrade to receive fill, finish subgrade of building or pavement areas, and aggregate base courses shall be proofrolled with a fully loaded dual wheel tandem axle dump truck or similar construction equipment. Four passes shall be made in each orthogonal direction. The proofrolling operation shall be observed by the Owner's testing agency. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the soil shall be scarified and moistened or aerated and recompact. Repeat proofrolling operations.

3.21 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace material to depth directed by the Architect or Owner's independent testing agency; reshape and recompact at optimum moisture content to the required density.
- C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION 312000

SECTION 312500 - EROSION & SEDIMENT CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following: Soil erosion and sedimentation control for all areas of the site that are graded or disturbed by any construction operations and elsewhere as indicated on the Drawings or specified herein. Erosion control shall be as specified herein and as may be required by actual conditions and governing authorities.
- B. The Contractor is fully responsible for all applicable permits and approvals for off-site borrow and waste areas.
- C. The Contractor shall have full responsibility for the construction and maintenance of erosion control and sedimentation control facilities as shown on the Drawings and as specified herein. The Contractor shall at all times provide the operation and maintenance necessary to operate the permitted sediment and erosion controls at optimum efficiency.
- D. The Contractor shall provide permanent or temporary ground cover as soon as possible over disturbed areas of the site and shall provide permanent or temporary ground cover in no more than 14 days after construction activities have permanently or temporarily ceased over the disturbed area. Temporary or permanent ground cover shall be provided on slopes within 7 days after construction activities have permanently or temporarily ceased.
- E. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 31 Section "Site Clearing"
 - 2. Division 31 Section "Earth Moving"
 - 3. Division 32 Section "Planting"

1.3 PRODUCT HANDLING

- A. Deliver seed, fertilizer and other packaged materials in unopened original packages with labels legible and intact. Seed packages shall bear a guaranteed analysis by a recognized authority.
- B. On-site storage of materials shall be kept to a minimum. Wet or damaged seed or other material shall be removed from the project site immediately.

1.4 MONITORING AND RECORD KEEPING

- A. Contractor shall abide by all conditions of the General Permit to Discharge Stormwater under the National Pollutant Discharge Elimination System (NPDES), Permit No. NCG010000 (obtain copy from Owner) and the general requirements listed below. NPDES General Permit No. NCG010000 can be viewed at:
https://files.nc.gov/ncdeq/Energy%20Mineral%20and%20Land%20Resources/Stormwater/NCG010000_Final_Permit_2019_04_01.pdf
- B. All sediment and erosion control devices and facilities shall be inspected at least once every seven (7) calendar days and within 24 hours after any storm event of greater than 0.5 inches of rain per 24 hour period.

- C. Stormwater discharges shall be inspected by observation for stormwater discharge characteristics (as listed below) at the above frequency to evaluate the effectiveness of the sediment control facilities, devices or practices. Observations shall be made at all stormwater discharge outfalls and other locations where concentrated stormwater discharges from the site. Observations shall be qualitative, no analytical testing or sampling is required. If any visible off-site sedimentation is leaving the site, corrective action shall be taken to reduce the discharge of sediments.
 - 1. Color.
 - 2. Odor.
 - 3. Clarity.
 - 4. Floating solids.
 - 5. Suspended solids.
 - 6. Foam.
 - 7. Oil sheen.
 - 8. Other obvious indicators of stormwater pollution.
- D. The contractor shall perform and keep records of the above inspections. Visible sedimentation found off the site shall be recorded with a brief explanation as the measures taken to prevent future releases as well as any measures taken to clean up the sediment that has left the site. This record shall be made available to the Owner, Architect and governmental authorities.

PART 2 - PRODUCTS

2.1 SOIL AMENDMENTS AND SEED

- A. Refer to Division 32 Section “Planting”.

2.2 MISCELLANEOUS

- A. Gravel for Stone Filters: Washed No. 57 stone or as indicated on the drawings.
- B. Silt Fence Fabric: A synthetic filter fabric or a pervious sheet of polypropylene, nylon, polyester, or polyethylene yarn, which is certified by the manufacturer or supplier as conforming to the following requirements.
 - 1. Tensile Strength (Grab): 90 x 90-lbs. min., ASTM D 4632.
 - 2. Permittivity: 0.05-sec⁻¹ min., ASTM D 4491.
 - 3. Apparent Opening Size: #30 US Sieve (0.60-mm) max., ASTM D 4751.
 - 4. UV Resistance (500-hrs): 70%, ASTM D 4355.
- C. Filter Fabric (for installation under riprap): Woven geotextile fabric, apparent opening size no larger than US Standard Sieve no. 70, min. grab strength of 120-lbs.
- D. Dewatering Silt Bag: Permeable, non-woven geotextile bag manufactured to accept and filter pumped, sediment-laden water from dewatering activities. Silt bag shall be sized as appropriate for the dewatering pump discharge rate and shall be fitted with a fill spout large enough to accommodate the discharge piping of the dewatering pump. Silt bag shall be Dirtbag as manufactured by ACF Environmental, Inc. or approved equal.
- E. Compost Filter Sock: Three-dimensional tubular sediment control device comprised of an organic compost filter media contained in a tubular knitted mesh sock.
 - 1. Filter media shall be mature compost that has been certified by the US Composting Council’s Seal of Testing Assurance Program and meeting the following specifications.
 - a. pH: 5.0 – 8.5.

- b. Moisture Content: < 60%.
 - c. Organic Matter: >25%, dry weight.
 - d. Particle Size: 99% passing 2-in sieve, 30-50% passing 3/8-in sieve.
- 2. Filter sock netting shall be 5-mm thick continuous HDPE filament, tubular knitted mesh with 3/8-in openings. Filled sock shall be a minimum of 12-in in diameter.
 - 3. Stakes shall be 2x2-in x 3-ft wooden stakes.

2.3 INLET PROTECTION MEASURES

- A. **Manufactured Inlet Sediment Control Device:** Storm drainage inlet sediment control device shall be manufactured from woven polypropylene geotextile to fit the opening of a catch basin or drop inlet to filter sediment from runoff entering the inlet. The device shall be a High Flow Siltsack as manufactured by ACF Environmental, Inc. or approved equal. Device shall be provided with an integral curb deflector if installed at a catch basin with a vertical opening adjacent to a horizontal grate.
- B. **Floor Drain / Area Drain Sediment Filter Device:** Small size storm drainage inlet sediment control device shall be manufactured from woven polypropylene geotextile to fit into small diameter floor drains to filter sediment from runoff entering the inlet. The device shall be a Round Drain Insert as manufactured by New Pig Corp. or approved equal.

2.4 CHANNEL AND SLOPE MATTING

- A. **Channel Matting:** Erosion Control blankets for installation in channels shall be a machine-produced mat of curled wood fiber (excelsior) or synthetic polypropylene fiber as specified below. The blanket shall be of consistent thickness with the fiber evenly distributed over the entire area of the mat. The blanket shall be covered with a photo degradable plastic netting secured to the fiber mat. Channel liners shall be excelsior mat unless otherwise indicated on the drawings.
 - 1. **Excelsior Mat:**
 - a. **Fiber:** Curled wood excelsior of 80% six inch or longer fiber length with a consistent width of fibers evenly distributed throughout the mat. Mat shall be smolder resistant with no chemical additives.
 - b. **Top and Bottom Netting:** Photo degradable extruded plastic netting with maximum mesh size of $\frac{3}{4}$ " x $\frac{3}{4}$ ".
 - B. **Slope Matting:** Erosion Control blankets for installation on slopes (not channels) shall be a machine-produced mat of crimped wood fiber and/or other degradable fibers manufactured without nets or threads. Staples or stakes used to secure the mat shall be wood or 100% biodegradable natural material. No nets or metal staples shall be used on any areas other than within channels.
 - 1. **Excelsior Mat:**
 - a. **Fiber:** Net-free, curled wood excelsior of 80% six inch or longer fiber length with a consistent width of fibers evenly distributed throughout the mat. Mat shall be smolder resistant with no chemical additives.
 - 2. **Stakes or Staples:** Wood or 100% biodegradable natural material with additive to cause breakdown and 100% degradation within 24-36 months after installation.

2.5 RIPRAP

- A. **Riprap:** Provide riprap of the class and quantity indicated on the Drawings. While no specific gradation is required, the various sizes of the stone shall be equally distributed within the required size range. The size of an individual stone shall be determined by measuring its long dimension. Stone shall meet the requirements of the following table for class and size distribution. No more than 5% of the material

furnished can be less than the minimum size specified nor no more than 10% of the material can exceed the maximum size specified.

REQUIRED STONE SIZES - INCHES			
CLASS	MINIMUM	MIDRANGE	MAXIMUM
A	2	4	6
B	5	8	12
1	5	10	17
2	9	14	23

PART 3 - EXECUTION

3.1 GENERAL

A. Existing Structures and Facilities

1. Existing structures, facilities, and water courses shall be protected from sedimentation.
2. The Contractor shall be responsible for the construction of necessary measures, and all costs shall be at the expense of the Contractor.
3. Items to be protected from sedimentation deposits shall include, but are not limited to, all downstream property, natural waterways, streams, lakes and ponds, catch basins, drainage ditches, road gutters, and natural buffer zones.
4. Control measures such as the erection of silt fences, barriers, dams, or other structures shall begin prior to any land disturbing activity. Additional measures shall be constructed as required during the construction.
5. All facilities installed shall be maintained continuously during construction until the disturbed areas are stabilized. Contractor shall remove all erosion control measures at the end of the project at his expense unless otherwise directed by the Owner or his representative.
6. Perform monitoring and record keeping as specified in this section.

3.2 PROTECTIVE MEASURES

A. Protective measures shall conform to all State and Local requirements.

B. Construction and maintenance of sediment and erosion control measures shall be in accordance with all applicable laws, codes, ordinances, rules and regulations.

1. Silt Fence: Hog wire or wire mesh fastened to posts as recommended by the Manufacturer and covered with silt fabric.
2. Berms and Diversion Ditches: These shall be graded channels with a supporting ridge on the lower side constructed across a sloping land surface. Diversion ditches and berms shall be planted in vegetative cover as soon as completed.
3. Mulching: Mulching shall be used to prevent erosion and to hold soil and seed in place during the establishment of vegetation.
4. **Matting: Temporary slope and channel matting shall be used for temporary stabilization during the establishment of seeded cover in all grassed ditches, channels, long slopes, and steep banks (6:1 or steeper) and additional areas as indicated on plans.** Matting shall be installed on any area on site as needed to provide temporary stabilization whether or not matting is indicated on the plan. Install as indicated or per manufacturer’s instructions. The installation of matting may be waived by the Architect if surface stabilization is obtained by other methods within the appropriate and agreed time frames. If adequate stabilization is not obtained, the Contractor shall install matting where required at no additional cost to the Owner.
5. Build Berm, Pits and Gravel Filter as shown on Drawings. Maintain during construction to keep erosion and sedimentation to a minimum. When it is necessary to remove berm, pits, and gravel, return area to required profiles and condition.

6. Construction Entrances: Construct all entrances in accordance with plans. Maintain all ingress/egress points to prevent tracking of soil onto the Owner's, public or private roads. Any soil that is tracked onto the roads shall be removed immediately.
7. Riprap: Stone shall be graded so that the smaller stones are uniformly distributed throughout the mass. Stone may be placed by mechanical methods, augmented by hand placing where necessary, provided that when the riprap is completed it forms a properly graded, dense, neat layer of stone.
8. Manufactured Inlet Sediment Control Device: Install device in accordance with manufacturer's instructions and install a curb deflector if appropriate. Inspect device after each rain event and at intervals not exceeding two weeks during construction. Remove, empty, clean, and replace the device as needed during construction. Empty collected sediment in approved, protected location. Remove and dispose of device following full and permanent stabilization of the contributing drainage area.
9. Dewatering Silt Bag: Install silt bag on an undisturbed slope so incoming water flows downhill through the bag without causing erosion. Remove and replace silt bag when device no longer drains efficiently due to accumulated sediment in bag. Empty bag within disturbed limits of the site protected by other sediment control measures.
10. Compost Filter Logs: Stake filter log every 10-ft. Drive stakes through the center of the log and 1-ft into the ground. If sock netting must be joined, fit beginning of the new sock over the end of the old sock, overlapping by 1-2 ft. Fill with compost and stake the joint.
11. Other Measures: Other methods of protecting existing structures and facilities, such as vegetative filter strips, diversions, rip-rap, baffle boards, and ditch checks used for reduction of sediment movement and erosion, may be used at the option of the Contractor when approved by the appropriate State or local authorities.

C. Provide the following, at a minimum, to prevent windblown dust.

1. Apply straw mulch and establish temporary or permanent ground cover on exposed soil where work is not being actively performed.
2. Cover or establish vegetative cover on stockpiles.
3. Apply water or other approved dust suppressant as needed to soil surfaces before they become excessively dry.
4. Sweep and collect soil that has been tracked onto paved surfaces.

3.3 STABILIZATION

- A. Permanently protect stabilized areas prior to the removal of protective devices.
- B. After the final establishment of permanent stabilization, remove temporary sediment control measures. Re-spread accumulated sediments as specified.
- C. Permanently stabilize all areas disturbed by the removal and re-spreading operations immediately.

3.4 TEMPORARY SEEDING

- A. In accordance with the schedule as detailed on the drawings.

3.5 PERMANENT SEEDING

- A. In accordance with the schedule as detailed on the drawings.

3.6 MULCHING AND MATTING

- A. Apply mulch or matting to retain soil and grass.
- B. Mulch areas with slope greater than 5% by spreading a light cover of mulch over seeded area at the rate of not less than 85 lbs. per 1000 sq. ft.

- C. Install temporary matting in all grassed ditches, channels, long slopes, and steep banks (6:1 or steeper) and additional areas indicated on plans or where extra protection from erosion is needed.

END OF SECTION 312500

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes provisions for hot-mixed asphalt paving over prepared subbase.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Material Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements of NCDOT "Standard Specifications for Roads and Structures".
- C. Job Mix Formula: Provide Geotechnical consultant with two copies of the proposed job mix formula at least ten days prior to beginning work. This formula shall be approved by NCDOT for the type of pavement specified.
- D. Recycled Content: 15% minimum, or as approved by NCDOT except as noted below.

1.4 SITE CONDITIONS

- A. Weather Limitations for Prime and Tack Coats: Apply prime and tack coats only when the surface to be treated is dry and when the atmospheric temperature measured at the location of paving operations away from artificial heat are in compliance with current NCDOT Standard Specifications for Roads and Structures. Do not apply tack coat when weather is foggy or rainy.
- B. Weather Limitations for Asphalt Courses: Apply hot-mixed asphalt surface, intermediate and base courses when surface and air temperatures are in compliance with current NCDOT Standard Specifications for Roads and Structures and when base is dry.
- C. Grade Control: Establish and maintain required lines and elevations.
- D. Traffic Control: Provide traffic control devices, lane closures, positive protection and/or any other warning or positive protection devices necessary for the safety of road users and pedestrians during construction.
 - 1. Traffic control shall be performed in conformance with the latest NCDOT Roadway Standard Drawings and Standard Specifications for Roads and Structures and the Manual on Uniform Traffic Control Devices for Streets and Highways.
 - 2. Sidewalk closures shall be installed as necessary. Pedestrian traffic shall be detoured around these closures and shall be signed appropriately and in accordance with ADA guidelines.
 - 3. Two-way traffic shall be maintained at all times through use of flagmen when necessary.
 - 4. Maintain access for fire-fighting equipment and access to fire hydrants.

1.5 QUALITY ASSURANCE

- A. All materials, construction methods and testing shall comply with the requirements of the latest editions of the North Carolina Department of Transportation (NCDOT) “Standard Specifications for Roads and Structures” and the Asphalt Handbook Manual Series No. 4 (MS-4).
- B. All work within any NCDOT right-of-way shall conform to the provisions and conditions of the NCDOT encroachment agreement(s) and driveway permit(s) and other applicable NCDOT standards and policies. The encroachment agreement(s) and driveway permit(s) are considered part of the project specifications by reference. Copies of the agreement(s) and permit(s) will be provided upon request from the Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Use locally available materials and gradations that comply with the requirements of the NCDOT "Standard Specifications for Roads and Structures" and exhibit a satisfactory record of previous installations.
- B. Aggregate Base Course (ABC): Type A aggregate base course meeting the requirements of the latest version of NCDOT "Standard Specifications for Roads and Structures.”
- C. Superpave Asphalt Paving Mix: Superpave base, intermediate and surface asphalt paving mix meeting the requirements of the latest version of NCDOT “Standard Specifications for Roads and Structures.” Types as indicated on the drawings.
- D. Tack Coat: Asphalt material meeting the requirement of the latest version of NCDOT "Standard Specifications for Roads and Structures.”
- E. Parking Lot Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
 - 1. Color: White for parking and bus lot striping.
 - 2. Color: Yellow for fire lanes and service area striping.
- F. Roadway Pavement Marking Paint: Thermoplastic Alkyd/Maleic and Hydrocarbon type, meeting the requirements of Section 1087 of NCDOT "Standard Specifications for Roads and Structures.”
 - 1. Color: As indicated on the drawings.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. General: Remove loose material from compacted subbase surface immediately before applying base courses of asphalt.
- B. Proof-roll prepared subgrade surface as described in Section “Earth Moving” to check for unstable areas and areas requiring additional compaction.
- C. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving. Ensure subgrade is graded for proper drainage. Repair as needed to avoid ponding on final pavement surfaces.
- D. Cold mill surfaces of existing pavements in locations and to depths as indicated on the drawings and as follows.
 - 1. At edges of existing pavement to be overlaid: Cold mill surfaces of existing pavements to a minimum depth of 1.5-inches at longitudinal terminus of asphalt overlays for a minimum width of

10 feet (extend terminus milling width to 100-ft on public roads) and at horizontal terminus (including along gutter line of existing curbs adjacent to asphalt overlays) for a minimum width of 6 feet to allow a smooth transition from full-depth thickness of overlay course to existing pavement or gutter surface. Thoroughly remove all loose material from milled surface before placing tack coat.

2. At pavement to be wedge overlaid: Cold mill surfaces of existing pavements to required depths at edges of asphalt wedge sections on public roads for widths needed to allow minimum depth thickness of wedge course. Thoroughly remove all loose material from milled surface before placing tack coat.
 3. At butt joint of new asphalt to existing asphalt: Cold mill surfaces of existing pavements to a minimum depth of 1.5-inches for a minimum width of 12-inches along length of new joint to allow new asphalt surface to be keyed-in to the existing pavement. Thoroughly remove all loose material from milled surface before placing tack coat.
- E. Thoroughly remove all dust and loose material from surfaces of that which the tack coat is to be applied along with adjacent surfaces before placing tack coat.
- F. Apply tack coat to all contact surfaces of milled asphalt, existing asphalt to be overlaid, and surfaces abutting or projecting into hot-mixed asphalt pavement including the vertical face of adjacent concrete gutter. Distribute evenly and thoroughly at a rate of 0.04 to 0.08 gallons per sq. yd. of surface.
1. Apply only as much tack coat as can be covered during the same day's operation.
 2. Take necessary precautions to limit the tracking and/or accumulation of tack coat material on either existing or newly constructed pavements. Excessive accumulation of tack may require corrective measures.
 3. Apply tack coat material with a distributor spray bar that can be adjusted to uniformly coat the entire surface at the directed rate. Use hand hose attachments only on irregular area and areas inaccessible to the spray bar. Cover these areas uniformly and completely.
 4. Apply tack coat to contact surfaces of gutters, concrete pavements, manholes, vertical faces of old pavements, and all exposed transverse and longitudinal edges of each course before mixture is placed adjacent to such surfaces.
 5. Cover curbs, adjacent concrete, and all other appurtenances to protect them from tracking or splattering tack coat material.
 6. Do not place any asphalt mixture until the tack coat has sufficiently cured.
- G. Allow to dry until at proper condition to receive paving.
- H. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.
- I. Place aggregate base courses as specified in Section "Earth Moving".

3.2 PLACING MIX

- A. Limitations: Do not produce or place asphalt mixtures during rainy weather, when the subgrade or base course is frozen, or when the moisture on the surface to be paved would prevent proper bond. Comply with all NCDOT weather and temperature limitations.
- B. General: Place hot-mixed asphalt mixture on prepared surface, spread, and strike off. Spread mixture at minimum temperature of 225 deg F. Place areas inaccessible to equipment by hand. Place each course to required grade, cross-section, and compacted thickness.
- C. Paver Placing: Place in strips not less than 10 feet wide, unless otherwise acceptable to Architect. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

- D. Immediately correct surface irregularities in finish course behind paver. Remove excess material forming high spots with shovel or lute.
- E. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of hot-mixed asphalt course. Clean contact surfaces and apply tack coat.

3.3 ROLLING

- A. General: Begin rolling when mixture will bear roller weight without excessive displacement.
- B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling, if required, with hot material.
- D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been evenly compacted.
- E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained required density. Compact the asphalt to at least the minimum percentage of the maximum specific gravity listed below unless otherwise allowed by NCDOT.
 - 1. SF-9.5A: 90.0% of Maximum Specific Gravity
 - 2. S-9.5B/C, I-19.0B/C, B-25.0B/C: 92.0% of Maximum Specific Gravity.
- F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot hot-mixed asphalt. Compact by rolling to specified surface density and smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.4 TRAFFIC MARKINGS

- A. Cleaning: Sweep and clean surface to eliminate loose material and dust.
- B. Materials: Use thermoplastic marking for permanent markings on public streets and stop bars and crosswalks on private drives and parking lots. Use marking paint for parking and fire lane striping and other markings on private drives and parking lots.
- C. Apply traffic paint with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates to provide minimum 12 to 15 mils dry thickness.

3.5 FIELD QUALITY CONTROL

- A. General: Testing of asphalt concrete mix and in-place hot-mixed asphalt courses for compliance with requirements for thickness and surface smoothness will be done by Owner's testing laboratory in accordance with Division 1 Section "Quality Control." Repair or remove and replace unacceptable paving as directed by Architect.
 - 1. Owner's Independent Testing Agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from the specified requirements.

- B. Thickness: In-place compacted thickness of each layer of asphalt shall be tested in accordance with ASTM D 3549. Results shall be considered unacceptable if the compacted thickness of any one core sample is greater than 1/2-inch below the thickness specified on the drawings or if the average thickness of all core samples is less than the thickness specified on the drawings.
- C. Surface Smoothness: Test finished surface of each hot-mixed asphalt course for smoothness, using 10 feet straightedge applied parallel with and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness:
 - 1. Base Course Surface: 1/4 inch.
 - 2. Wearing Course Surface: 3/16 inch.
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- E. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.
- F. Contractor shall repair all test core holes with full depth asphalt patch.
- G. Perform ponding water tests. Repair areas of pavement that pond water.
- H. Check surface areas at intervals as directed by Architect.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes exterior portland cement concrete paving for the following:
 - 1. Curbs and gutters, pavement, walkways, service court, dumpster pads.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 31 Section "Earth Moving" for subgrade preparation, grading and subbase course.
 - 2. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
 - 3. Division 07 Section "Sealants and Caulking" for joint fillers and sealants within concrete paving and at joints with adjacent construction.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, joint systems, curing compounds, dry-shake finish materials, and others if requested by Architect.
- C. Design mixes for each class of concrete. Include percentage of recycled content (20% minimum). Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- D. Scaled plan of proposed construction, expansion and control joint locations in concrete pavement and concrete sidewalk. Submittal of plans for joints in curb and gutter or longitudinal sidewalk 6-feet or less in width is not required.

1.4 QUALITY ASSURANCE

- A. Concrete Standards: Comply with provisions of the following standards, except where more stringent requirements are indicated.
 - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 - 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 - 3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Concrete Testing Service: Engage a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
1. Use flexible or curved forms for curves with a radius 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- D. Plain Steel Wire: ASTM A 82, as drawn.
- E. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
1. Unless indicated otherwise on the drawings, dowels shall be the following diameter:
 - a. 6-in slabs: 5/8-in diameter dowels.
 - b. 7-in slabs: 1-in diameter dowels.
 - c. 8-in or thicker slabs: 1-1/4-in diameter dowels.
- F. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, portland cement, Type I, II, or III.
 - a. Fly Ash: ASTM C 618, Class F. Up to 30% by weight of required cement content, with 1.0-lbs Fly Ash per 1-lb of cement replaced.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120 with 1-lb slag per 1-lb of cement replaced.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.
 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M, potable.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.6 RELATED MATERIALS

- A. Expansion and Isolation Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Wheel Stops: Precast, air-entrained concrete; 2500-psi minimum compressive strength; approximately 6 inches high, 9 inches wide, and 84 inches long. Provide chamfered corners and drainage slots on underside and provide holes for dowel-anchoring to substrate.
 1. Dowels: Galvanized steel, diameter of 3/4 inch, minimum length 10 inches.
- C. Slip Resistive Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

- D. Bonding Agent: ASTM C 1059, Acrylic or styrene butadiene.
- E. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 4000 psi, 3500 psi, or 3000 psi as indicated on the drawings.
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: As specified by NCDOT Standard Specifications for class of concrete indicated.
 - 3. Slump Limit: Maximum 3.5 inches for non-vibrated, maximum 4 inches for vibrated.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 - 1. Air Content: 5-1/2 percent plus or minus 1.5 percent for 1-1/2-inch (38-mm) nominal maximum aggregate size.
 - 2. Air Content: 6 percent plus or minus 1.5 percent for 1-inch (25-mm) nominal maximum aggregate size.
 - 3. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size.
- D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use admixtures in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:
 - 1. Fly Ash: 30 percent.
 - 2. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 3. Combined Fly Ash, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash not exceeding 20 percent.
- F. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.
 - 1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

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

2.9 JOINT SEALANTS

- A. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
- B. Round Backer Rod for Cold-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and pavement bottom-side adhesion of sealant.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving. Ensure subgrade is graded for proper drainage. Repair as needed to avoid ponding on final pavement surfaces.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.
- C. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subbase.
- D. Place aggregate base courses as specified in Division 31 Section "Earth Moving".

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement. Set forms to ensure positive drainage and compliance with ADA and Building Code requirements.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in 10 feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.3 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable at mid depth of concrete. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 JOINTS

- A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.
- B. Contraction (Control) Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as indicated below unless shown otherwise on Drawings. Construct contraction joints for a depth equal to at least 1/3 of the concrete thickness, as follows:
 - 1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction cracks.
 - 3. Inserts: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.
 - 4. Spacing:
 - a. Concrete Pavement (4-in to 4.5-in thick slabs): Locate contraction joints at 10-ft max. intervals, each way in concrete pavement.
 - b. Concrete Pavement (5-in to 5.5-in thick slabs): Locate contraction joints at 12.5-ft max. intervals, each way in concrete pavement.
 - c. Concrete Pavement (6-in and greater thick slabs): Locate contraction joints at 15-ft max. intervals, each way in concrete pavement.
 - d. Sidewalk & Patios (4-in thick slabs): Locate contraction joints at 5-ft max. intervals, each way in concrete sidewalks/patios unless shown otherwise. Locate contraction joints in sidewalks less than 8-ft in width at 5-ft intervals across the walk. Locate contraction joints in sidewalks of 8-ft and greater width at 5-ft intervals across the walk and equally section the walk lengthwise with joints at 5-ft. max. intervals (example: an 8-ft wide walk shall have contraction joints at 5-ft. spacing across the walk and one joint dividing the walk lengthwise into two, equal 4-ft sections.)
 - e. Curbs or Curb & Gutter: Locate contraction joints at 10-ft max. intervals in concrete curbs or concrete curb and gutter.
 - 5. Dowels: Some concrete pavement applications in very heavy load locations (such as fire stations) require dowels at contraction joints. Refer to the drawings for specific details for such requirements.
- C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
 - 1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
 - 2. Provide tie bars at sides of paving strips where indicated.
 - 3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

- D. Isolation (expansion) Joints: Form isolation joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. General spacing: Locate additional expansion joints at the following intervals unless indicated otherwise on the drawings.
 - a. Pavement (greater than 4-in thick slabs): None in addition to located specified above.
 - b. Sidewalks (4-in thick slabs): 30-ft each way.
 - c. Curbs or Curb & Gutter: 90-ft spacing.
 2. Extend joint fillers full width and depth of joint 1/2 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
 3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
 2. Diamond Dowel System is acceptable in lieu of round dowels. Contractor to provide submittal information to Engineer for review/approval. Install per manufacturer recommendations.

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work. Ensure forms are set to ensure water will not pond on final surface.
- B. Remove snow, ice, or frost from base surface and reinforcing before placing concrete. Do not place concrete on surfaces that are frozen.
- C. Moisten base to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- F. Form and pour concrete pavement with thickened edges along all edges that could be subject to vehicle wheel loads, do not abut a building or wall, or are not doweled to the adjacent pavement or structure.
- G. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- H. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.

- I. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.
- J. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Architect.
- K. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.
 - 1. Spill Gutters: Form and install curb and gutter with gutter pans that spill at ¼” per foot slope away from the curb in the following locations. Do not install curb and gutter that will pond water.
 - a. Outside of the Public Right of Way: Provide spill gutter where curb and gutter is located adjacent to pavement surfaces that slope away from curb.
 - b. Within the Public Right of Way: Slope gutter per NCDOT Standard Drawing 846.01.
- L. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- M. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
 - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 - 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

- A. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots to ensure positive drainage and eliminate ponding. Refloat surface immediately to a uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across all site concrete sidewalk and pavement surfaces perpendicular to line of traffic to provide a uniform fine line texture finish.
- B. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to a radius of ¼-inch unless indicated otherwise on the drawings. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
- C. Step Tread Grooves: Tool three (3) parallel grooves along entire top front edge of new concrete stair treads.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 TRAFFIC MARKINGS

- A. Cleaning: Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.
- B. Surface Preparation: Surfaces shall be cured, clean, dry and sound. Remove all peeling paint from existing surfaces. Concrete surfaces shall cure minimum 30 days. Concrete sealers or efflorescence of new concrete should be removed by extended weathering, etching or abrasive blasting.
- C. Application Conditions: 50° min., 90° maximum (air, surface, and materials) at least 5° above dew point. Relative humidity 85% maximum.
- D. Tinting: Mix colors per manufacturer's specification. Only mix like paints (do not mix latex with acrylic or interior paints with exterior paints) to achieve required colors.

- E. Apply play area markings at manufacturer's recommended rates to provide minimum 15 mils dry thickness. Special care shall be given to laps and edges of stencils to prevent excessive film thickness.
- F. Apply traffic paint with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates to provide minimum 12 to 15 mils dry thickness.

3.9 FIELD QUALITY CONTROL TESTING

- A. The Owner shall employ an independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement in accordance with Division 01 Section "Quality Control" and as follows:
 - 1. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
 - 2. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within one week of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.
- E. Remove and replace concrete paving or curb and gutter that ponds water.

END OF SECTION 321313

SECTION 329000 - PLANTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Trees.
 - 2. Shrubs.
 - 3. Seeded lawns, sod and “no-mow” areas.
 - 4. Topsoil and soil amendments.
 - 5. Fertilizers and mulches.
 - 6. Stakes and guys.
 - 7. Landscape edging.
 - 8. Maintenance, guarantees and warranties.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 31, Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
 - 2. Division 31, Section "Earth Moving" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.
 - 3. Division 31 Section “Erosion Controls” soil erosion and sedimentation control.

1.3 INDUSTRY STANDARDS

- A. References: Some products and execution are specified in this Section by reference to published specifications or standards of the following:
 - The American Society for Testing and Materials (ASTM)
 - American Association of Nurserymen (AAN)
 - US Department of Agriculture (USDA)
 - NC Department of Agriculture (NCDA)
 - NC Composting Council (NCCC)
- B. Landscape Contractor shall mean a registered “Landscape Contractor” as defined by the NC General Statute 89D (www.ncclcb.com). Unless proper credentials and evidence of experience can be supplied to prove equal capabilities, only a Landscape Contractor licensed in the State of NC shall be permitted to perform the work.
 - 1. The Landscape Contractor’s performance shall conform to the requirements in the most current edition of the NC Landscape Contractors Manual (NCLCM) as approved by the NC Board of Landscape Contractors. In the event the Landscape Contractor feels there is discrepancy between the NCLCM and the requirements of this Contract that could affect the quality of work; it is the Contractor’s responsibility to apprise the Owner and Landscape Architect of the issue.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

- B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.
 - 1. Manufacturer's certified analysis for standard products.
 - 2. Label data substantiating that plants, trees, shrubs, and planting materials comply with specified requirements.
- C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- D. Samples of each of the following:
 - 1 Sample of imported mulch (1) 1-gal. sized bag.
 - 2 Topsoil (1) 1-gal sized bag.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, at least fifteen names and address of architects and owners, total years of experience and landscape contractor's license number. If the landscape contractor hires a sub-contractor for seeding operations, the same references shall be required from them also.
- F. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.
 - 1. Analysis of existing topsoil and suitability as a medium for growing specified lawn. Include recommendations of amendments required to make existing topsoil suitable as a growing medium for specified lawn, if required.
 - 2. Analysis of imported topsoil, if required due to unacceptability of existing topsoil to meet acceptable growing medium requirements for lawn.
- G. Planting schedule indicating anticipated dates and locations for each type of planting.
- H. Maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.
- I. Landscape plant schedule, per Article 1.4, A, C, indicating quantity, botanical name, common name, specified size and vendor source for each individual plant species; including any substitutions. Include all cultivars and varieties for substitutions. Provide vendor source contact information as attachment to schedule.

CLH Design and the Owner reserve the right to reject any substitution requests and may request that the landscape contractor provide additional vendor search information and/or complete documentation to prove a hardship, to confirm reason(s) for substitution or to prove that the material is not available from local and national nurseries.

Refer to section 1.6, C for information regarding the appropriate time to dig trees. It is the Contractor's responsibility to plan ahead of time rather than waiting and checking availability at the time of installation.

- J. All sod shall be from a certified sod producer and be blue tag certified in accordance with NCCIA and AOSCA.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.
- B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- C. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."
 - 1. Contractor shall show proof of cultivar authenticity to Landscape Architect. When cultivars are specified, standard species will not be acceptable.
- D. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil.
 - 1. Report suitability of on-site topsoil for growth of applicable planting material. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce a satisfactory topsoil at no additional cost to owner.
- E. Measurements: Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

When size ranges are given, 50 % of plant material shall be at the larger size.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 01 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.
- B. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
- C. Trees and Shrubs: Deliver freshly dug trees and shrubs. Do not prune before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery. For trees which cannot be dug in the summer, Contractor shall have trees pre-dug and heeled-in at the nursery where they are grown until planting. Contractor shall be responsible for ensuring that the trees have been adequately watered and cared for at the nursery prior to delivery. No substitutions will be allowed for trees which cannot be "summer-dug".
- D. Handle balled and burlap stock by the root ball.

- E. Deliver trees, shrubs, and ground covers after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist.

PLANT MATERIAL SHALL NOT BE DELIVERED TO THE SITE MORE THAN 72 HOURS BEFORE PLANTING TAKES PLACE. THE LANDSCAPE ARCHITECT RESERVES THE RIGHT TO REJECT ALL MATERIAL NOT PLANTED WITHIN THAT TIME PERIOD UNLESS THE LANDSCAPE CONTRACTOR MAKES HEELING-IN AND IRRIGATION PROVISIONS WITHIN 24 HOURS OF PLANT DELIVERY.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.7 PROJECT CONDITIONS

- A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.

1.8 COORDINATION AND SCHEDULING

- A. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.

Planting Season: The normal season for planting balled and burlap material is November 15 through March 15. The normal season for planting container grown material is September 15 through April 15. After notification to proceed, planting operations shall be conducted under favorable weather conditions during the normal planting season. The Landscape Contractor shall make provisions for watering the material on an as-needed basis and as frequently as is required to ensure that plant material thrives.

The General Contractor shall coordinate the planting schedule with the Landscape Contractor to avoid any summer digging and planting.

The Landscape Architect shall be notified and must approve of any schedule changes which may require summer planting. THE CONTRACTOR SHALL NOT BE COMPENSATED FOR ADDITIONAL WATERING COSTS FOR PLANTINGS WHICH ARE INSTALLED IN THE SUMMER.

- B. Temporary Seeding: In accordance with the schedule as detailed on the drawings.
 1. In the event the Landscape Contractor is required to establish a temporary seeding cover due to the construction schedule, the Landscape Contractor is not relieved from providing the specified permanent seed mixture.
 2. The Landscape Contractor is responsible for eradicating any temporary seed cover by means of mowing, thatching and using an herbicide approved by the Owner's representative at the manufacturer's recommended rate.

1.9 GRASS ESTABLISHMENT SCHEDULE

- A. Refer to the Supplementary Conditions for Final Completion dates of grassed areas of the site.
- B. Definitions:

1. Final Complete seeded or sprigged grass: A healthy, dense, weed free stand of the specified species of grass with 95% grass coverage as evaluated on a per square yard sample basis. Required topdressing for play fields may be applied following Final completion.
 2. Final Complete sodded grass: An installed and rolled healthy sod, free of weeds and dead spots. Required topdressing for play fields may be applied following Final completion.
- C. Complete Site: A complete installation of grass sod and/or stand of grass, germinated from seed or sprigs, on the complete site shall be established by the following date:
1. Complete Site (Seed, Sprig or Sod) Final Completion: *See Final Completion Date noted in contract documents.* Due to seasonal restrictions the specified date shall not be extended. Extension to the Contract Time will not change this date.

1.10 WARRANTY

- A. General Warranty: The special warranty specified 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 Warranty: Contractor is responsible for general maintenance and care during warranty period. Contractor agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth; except for defects resulting from abuse or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 2. Warranty Periods from Date of Final Completion:
 - a. Trees, Shrubs, and Ornamental Grasses: 12 months.
 - b. Lawn, grass and sod (herbicide and fertilizer): 12 months
 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.
 4. Areas seeded or sodded that are bare and not established at the end of the warranty period shall be re-seeded or re-sodded at no additional cost to the Owner.
 5. Contractor is responsible for applying weed control herbicide and fertilizers during warranty period.

1.11 TREE AND SHRUB MAINTENANCE

- A. Maintain trees and shrubs by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free

of insects and disease. The presence of significant insects or disease at the end of warranty period shall be grounds for rejection of material. Restore or replace damaged tree wrappings. Maintain trees and shrubs until end of warranty period.

1.12 LAWN/GRASS MAINTENANCE

- A. Begin maintenance of lawns and other grassed areas immediately after each area is planted and continue until acceptable lawn is established and accepted by the Owner, but for not less than the following periods:
1. Seeded Lawns/Grass and Naturalized Seed Areas: **Final Completion.**
 - a. When full maintenance period has not elapsed before end of planting/growing season, or if lawn is not fully established at that time (95% coverage as established on a per square yard sample basis), continue maintenance during next planting season until 95% coverage is established.
 2. Sodded Lawns/Grass: **Final Completion.**
 - a. Sodded areas will be accepted at final inspection if –
 1. Sodded areas are properly established.
 2. Sod is free of bare and dead spots and without weeds.
 3. Sodded areas have been mowed a minimum of twice.
- B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches (100 mm). Following the date of project Final Completion, water from irrigation may be obtained from the site water system.
1. Supplement natural precipitation to provide a net rate of one inch of water per week or as required to maintain lawn in a thriving condition.
 2. Watering shall conform to the time, volume and frequency recommendations of applicable governmental water conservation regulations.
 3. Irrigate at minimum rate of once per day for two full weeks following date of seeding or sod installation.
 4. Irrigate at minimum of once per week for remainder of maintenance period.
- D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height at any mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.
- E. Postfertilization: Apply fertilizer to lawn after first mowing and when grass is dry. Apply only from August through October.
1. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of lawn area or as required to maintain lawn in a thriving condition. A minimum of 50% of the nitrogen shall be in a slow-release form.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

- A. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement, including trunks which are not straight on single stem trees.
- B. The natural stem/root collar of balled and burlap materials shall be found within two inches of the nursery-maintained soil line. Trees shall not be accepted which have been grown too deeply or too high in the soil profile.
- C. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.
- D. Label one tree and shrub in each plant grouping with securely attached, waterproof tag bearing legible designation of botanical and common name. Proof of cultivar shall be required on all species for which a cultivar is designated.
- E. Label at least 1 tree and 1 shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.
- F. Imported Fire Ant Control: All plants shall be accompanied by a certificate stating: “certified under all applicable state and federal quarantine.” Contact Landscape Architect for inspection of all plant materials for the presence of imported fire ants. The presence of fire ants shall be cause for rejection of plant material.

2.2 SHADE AND FLOWERING TREES

- A. Shade Trees: Single-stem trees with straight trunk, free of basal sprouts, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required. Grounds for rejection may include, but not limited to: improper branch density or distribution, “v” crotches, including bark, undesirable multiple leaders, leaders that have been topped or headed back, prevalent suckering or epicormic sprouting. Trees which have evidence of unevenly distributed, girdling or suckering roots may be rejected.
 - 1. Branching Height: 1/2 of tree height.
- B. Small Trees: Small upright or spreading type, branched or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, and stem form as specified in the Plant List on the drawings. Good structure shall be especially critical for trees. Grounds for rejection may include, but not limited to: improper branch density or distribution, “v” crotches, including bark, undesirable multiple leaders, leaders that have been topped or headed back, prevalent suckering or epicormic sprouting. Trees which have evidence of unevenly distributed, girdling or suckering roots may be rejected.
- C. Provide balled and burlap trees unless noted otherwise on the drawings. Plants designated “B&B” in the plant list shall be balled and burlap. They shall be nursery grown and freshly dug. They shall be dug with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Balls shall be firmly wrapped with untreated biodegradable burlap and bound with twine, cord, or wire mesh basket. Plants shall not be accepted if the ball is dry, deformed or broken before or during the planting operations.

2.3 DECIDUOUS SHRUBS

- A. Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.
- B. Provide container grown shrubs unless noted otherwise on the drawings.

2.4 CONIFEROUS EVERGREENS

- A. Form and Size: Specimen-quality, exceptionally heavy, tightly knit, symmetrically shaped coniferous evergreens.
- B. Provide balled and burlap coniferous evergreens.
 - 1. Container-grown coniferous evergreens will be acceptable in lieu of balled and burlap coniferous evergreens subject to meeting ANSI Z60.1 limitations for container stock and provided they are equal in quality and size to balled and burlap material.

2.5 BROADLEAF EVERGREENS

- A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, conforming to ANSI Z60.1.
- B. Provide balled and burlap broadleaf evergreens.
 - 1. Container-grown broadleaf evergreens will be acceptable in lieu of balled and burlap broadleaf evergreens subject to meeting ANSI Z60.1 limitations for container stock and provided they are equal in quality and size to balled and burlap material.

2.6 GRASS/LAWN MATERIALS

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.
 - 1. Seed Mixture: Provide seed of grass species and varieties as specified in the plans and/or specifications.
 - 2. Sod shall be as indicated on the plans and detail drawings. Provide machine cut, strongly rooted, certified turf grass sod, not less than two years old, free from weeds and undesirable native grasses and stripped not more than 24 hours before laying. Sod pad size shall be uniform thickness of 5/8", plus or minus 1/4", measured at the time of cutting and excluding top growth and thatch.

2.7 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 1 inch (25 mm) or larger in any dimension, and other extraneous materials harmful to plant growth. Sticks, roots, and clay clumps shall be removed from topsoil prior to spreading.
 - 1. Topsoil Source: Reuse surface soil stripped and stockpiled on the site if adequate quantities exist. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Screen topsoil of roots, plants, sods, stones greater than 1/2" diameter in general lawn areas and planting beds, clay lumps, and other extraneous materials harmful to plant growth. Screen topsoil prior to planting. If inadequate quantities of topsoil exist on-site contractor will be required to import pre-screened topsoil.
 - 2. A minimum depth of 3 inches shall be required.

2.8 SOIL AMENDMENTS

- A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 (2.36 mm) sieve and a minimum 75 percent passing a No. 60 (250 micrometer) sieve.
 - 1. Provide lime in the form of dolomitic limestone.

- B. Organic Compost: Organic compost of neutral character, decomposed, stable and weed-free meeting the US Composting Council standards.
- C. Perlite: Horticultural perlite, soil amendment grade.
- D. Peat Humus: Finely divided or granular texture, with a pH range of 6 to 7.5, composed of partially decomposed moss peat (other than sphagnum), peat humus, or reed-sedge peat.
- E. Peat Humus: For acid-tolerant trees and shrubs, provide moss peat, with a pH range of 3.2 to 4.5, coarse fibrous texture, medium-divided sphagnum moss peat or reed-sedge peat.
- F. Sawdust or Ground-Bark Humus: Decomposed, nitrogen-treated, of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
 - 1. When site treated, mix with at least 0.15 lb (2.4 kg) of ammonium nitrate or 0.25 lb (4 kg) of ammonium sulfate per cu. ft. (cu. m) of loose sawdust or ground bark.
- G. Manure: Well-rotted, un-leached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.
- H. Herbicides: EPA registered and approved, of type recommended by manufacturer.
- I. Water: Potable.
- J. Mycorrhizae: Applied to planting hole backfill or planting bed solid. Product shall be formulated for the moisture regime of the particular planting location (low, medium, high) contain a broad spectrum of mycorrhizae species, an organic bi-stimulant (2-2-2 preferred) and a water holding gel (low moisture locations only). Apply per manufacturer's recommendations.

2.9 FERTILIZER

- A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency and as needed to maintain plant material and lawns in a thriving condition.
- D. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency and as needed to maintain plant material and lawns in thriving condition.

2.10 MULCHES

- A. Organic Mulch: Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following:
 - 1. Triple Shredded Hardwood Mulch: At least 80% hardwoods with moisture content of 30% or less, that can pass through a maximum screen size of 1 5/8". Raw material shall contain no yard waste, construction debris, or any other extraneous material.
 - a. Depth: 3" (after compaction)
 - b. Refer to plans for location.
 - a. Depth: 3" (after compaction)
 - b. Refer to plans for location.

2.11 EROSION-CONTROL MATERIALS

- A. Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
- B. Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, 0.92 lb per sq. yd. (0.5 kg per sq. m) minimum, with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

2.12 STAKES AND GUYS

- A. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated softwood, free of knots, holes, cross grain, and other defects, 2 by 2 inches (50 by 50 mm) by length indicated, pointed at one end.
- B. Use flexible Arbor tape or equivalent 3/4" woven belt synthetic fabric strap installed per manufacturer's specifications. Color: Green.
- C. Flags: Standard surveyor's plastic flagging tape, pink, 6 inches (150 mm) long.
NOTE: Clearly mark all guy wires with flagging for visibility, especially near recreation and pedestrian areas.

2.13 LANDSCAPE EDGINGS

- A. "V" Ditch: A 4-inch deep trench by 6 inches width around all planting beds. Except where beds are adjacent to naturally wooded areas due to the possible damage to existing tree roots. Use care around existing tree roots in and around all planting beds. Do not cut existing tree roots to form the "V" ditch, work around them wherever possible.

2.14 MISCELLANEOUS MATERIALS

- A. Anti-desiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's instructions. Apply as per nursery's recommendations. It should be applied prior to plant transport from the nursery where it is dug, if in full leaf.

2.15 TACKIFIER

- A. Non-asphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected. Do not seed the site until the Landscape Architect has reviewed the final grades.

3.2 PREPARATION

- A. Lay out individual tree and shrub locations and areas for multiple plantings. Entire areas for multiple plantings shall be chiseled to a depth of 12 inches and tilled and amended to a depth of 8 inches with the same soil mixture as is required for planting backfill material. Stake locations, outline areas, and secure Landscape Architect's acceptance before the start of planting work. Make minor adjustments as may be required.

3.3 PLANTING SOIL PREPARATION

- A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
- B. Mix soil amendments and fertilizers with topsoil at rates indicated. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.
- C. For tree pit or trench backfill, mix planting soil before backfilling and stockpile at site.
- D. For planting beds, mix planting soil prior to planting.
 - 1. Mix lime with dry soil prior to mixing fertilizer. Prevent lime for lawn plantings from contacting roots of acid-tolerant plants.
- E. Do not attempt soil preparation of plant installation when soils are frozen, wet, in poor tilth or otherwise unsuitable for planting.

3.4 LAWN PLANTING PREPARATION

- A. Limit subgrade preparation to areas that will be planted in the immediate future.
- B. Loosen subgrade to a minimum depth of 8 inches. Remove stones larger than 1/2 inch (19 mm) in any dimension and sticks, roots, rubbish, and other extraneous materials. Remove excess gravel which will inhibit lawn establishment and survival.
- C. Spread topsoil to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen.
 - 1. Place approximately 1/2 the thickness of topsoil required. Work into top of loosened subgrade to create a transition layer and then place remainder of the topsoil.
- D. Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:
 - 1. Remove and dispose of existing grass, vegetation, and turf. Do not turn over into soil being prepared for lawns.
 - 2. Till surface soil to a depth indicated on soil test report, but at a minimum of 6 inches (150 mm). Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Trim high areas and fill in depressions. Till soil to a homogenous mixture of fine texture.
 - 3. Clean surface soil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

4. Remove waste material, including grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1 inch in any dimension (1/2 inch in playing fields), and other objects that may interfere with planting or maintenance operations. Remove all glass, wire or other objects of any size which may cause injury.
- F. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- G. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.
- H. Contact Owner and Landscape Architect for review and approval of seedbed preparation and seeding methods prior to and during seeding operations.

3.5 EXCAVATION FOR TREES AND SHRUBS

- A. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation. Refer to planting details.
 1. Place tree in pit by lifting and carrying the tree by its ball (never lift by branches or trunk) and then lowering it into the pit. Set the tree straight, plumb and in the center of the pit with the most desirable side of the tree facing the prominent view (sidewalk, building, street, etc.).
 2. Determine the elevation of the root flare and ensure that it is planted at or slightly above finished grade. This may require that the tree be set higher than the grade in the nursery. If the root flare is less than 2-inches below the soil level of the root ball, plant the tree at the appropriate level above the grade, so the flare is even with the grade. If the flare is more than 2-inches at the center of the root ball above the grade, the tree shall be rejected.
- B. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
- C. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.
- D. Fill excavations with water and allow to percolate out, before placing setting layer and positioning trees and shrubs.

3.6 PLANTING TREES AND SHRUBS

- A. Set balled and burlap stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
 1. Place stock on setting layer of compacted planting soil.
 2. Remove burlap from tops of balls and partially from sides, but do not remove from under balls. Remove the top 2/3's of the wire baskets. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked or broken before or during planting operation.
 3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.
- B. Set container-grown stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.

1. Carefully remove containers so as not to damage root balls.
2. The root ball shall be loosened to alleviate matted or encircling roots. Roots shall be spread out evenly in an outward, radial fashion.
3. Place stock on setting layer of compacted planting soil.
4. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.

C. Dish and tamp top of backfill to form a 3-inch- (75-mm-) high mound around the rim of the pit. Do not cover top of root ball with backfill.

D. Wrap trees of 2-inch (50-mm) caliper and larger with trunk-wrap tape if the species is susceptible to sun or wind scorch. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation and take corrective measures required before wrapping. Do not wrap the trees at the base to discourage insect infestation.

3.7 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs as directed by Landscape Architect.

B. Only minimal pruning should be necessary at time of planting since plant material shall conform to the specified standards for quality. All pruning performed by the Contractor shall conform to the standards of the current ANSI A300, American National Standard for tree care operations. Under no circumstances shall the Contractor cut or prune leaders or remove more than 1/3 of the top without permission of the Landscape Architect. Prune to remove dead wood, crossovers, split or broken branches. Do not shorten, trim or clip branches solely for appearance purposes unless directed to by the Landscape Architect.

3.8 TREE AND SHRUB GUYING AND STAKING

A. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend at least 72 inches (1800 mm) above grade. Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 2 strands of flexible Arbor tape or equivalent 3/4" woven belt synthetic fabric strap at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree. Flag heavily in recreation areas or any places where children are likely to be.

Note: Only upright staking of trees will be allowed around child play areas to avoid tripping hazards. Refer to the staking detail on the drawings.

3.9 MULCHING

A. Mulch backfilled surfaces of pits, trenches, planted areas, and other areas indicated.

B. Organic Mulch: Apply the following average thickness of organic mulch and finish level with adjacent finish grades. Do not place mulch against trunks or stems. Refer to section 2.10 for additional information.

1. Thickness: 4 inches (mulch depth shall be 3" after compaction and settling).

NOTE: Mulch shall NOT be from on-site chipping operations (unless specifically indicated in plans and specifications).

3.10 SEEDING NEW LAWNS

- A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
- B. Sow seed at the rates required to achieve 95% coverage prior to Final completion as determined on a per square yard basis.
- C. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray. Remove surface rocks of greater than 1" diameter.
- D. Protect seeded slopes 6:1 (H:V) and steeper against erosion with erosion-control blankets installed and stapled according to manufacturer's recommendations.
- E. Protect seeded areas with slopes flatter than 6:1 against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 2 tons per acre (45 kg per 100 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) loose depth over seeded areas. Spread by hand, blower, or other suitable equipment. Tack with liquid asphalt tack (9 gals/1,000 SF) or non-asphaltic tackifier.
- F. If seeding occurs in summer months, protect seeded areas against hot, dry weather or drying winds by applying peat mulch within 24 hours after completion of seeding operations. Soak and scatter uniformly to a depth of 3/16 inch (4.8 mm) thick and roll to a smooth surface.

3.11 RECONDITIONING LAWNS

- A. Recondition existing lawn areas damaged by Contractor's operations, including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor regrading is required.
- B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- C. Where repairable lawn remains, as determined by the Owner, mow, dethatch, core aerate, and rake heavily and deeply. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- D. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- E. Till stripped, bare, compacted or otherwise unrepairable areas thoroughly to a depth of 8 inches.
- F. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Provide new planting soil as required to fill low spots and meet new finish grades.
- G. Apply seed and protect with straw mulch as required for new lawns.
- H. Water newly planted areas and keep moist until new grass is established.

3.12 SODDING NEW LAWNS

- A. Lay sod to form solid, uniform mass with tightly fitted joints. "Butt" ends and sides of sod strips. Do not overlap sod strips. Stagger strips to offset joints in adjacent courses. Lay sod strips across slopes and perpendicular to drainage flow. Tamp or roll lightly to ensure contact with subgrade.

- B. Secure with pegs or staples at spacing recommended by the sod grower and supplier and as approved by the Landscape Architect and Owner. If pegs or staples are used for athletic fields, they shall be removed upon full establishment prior to final acceptance.
- C. Water sod with fine spray immediately after planting. Water daily during first two weeks of establishment to maintain soil to depth of 4”.
- D. At no time shall sodded turf be allowed to grow over 3 inches in height. Throughout this period, the target mowing height shall be 1.5 inches. At no time shall more than 50% of the turf height be removed in any three-day period by mowing or other maintenance activity.
- E. Sodded turf shall be fertilized according to the monthly application rates recommended in Carolina Lawns for the utilized grass or at reduced rate if instructed by the Landscape Architect.
- F. Weed control shall be provided as necessary to prevent the establishment or proliferation of a weed species and to achieve acceptable turf at time of initial Acceptance.
- G. Remove all poly mesh netting prior to placement and dispose of off-site.

3.13 INSTALLATION OF EDGINGS

- A. “V” Ditches: Clearly delineate planting beds, play areas and sign locations with a 4-inch deep by 6-inch wide ditch. Lines shall be smooth. A minimum five-foot wide lawn strip shall be provided between planting beds and paved surfaces where shown on the drawings.

3.14 INSTALLATION OF MISCELLANEOUS MATERIALS

- A. Apply anti-desiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.
 - 1. When deciduous trees or shrubs are moved in full-leaf, spray with anti-desiccant at nursery before moving and again 2 weeks after planting.

3.15 INSPECTION AND ACCEPTANCE

- A. When landscape work is completed, including maintenance, Architect will, upon written request, make a final inspection to determine acceptability.
- B. At time of inspection for initial Acceptance, turf shall have been freshly mowed within the last 48 hours. Turf shall be healthy, of uniform color and exhibiting signs of good growth. A minimum of 95% of the specified seeding area shall be covered in established turf possessing both stolens (i.e. runners) and rhizomes. There shall be no bare areas greater than 4 sq. ft. or 1.5 ft. in any dimension. Seedling plants not having reached tiller stage (i.e. runner producing) shall be considered bare area. Turf shall be 100% free of noxious and perennial weeds and relatively free of annual weeds.
- C. At time of inspection for initial Acceptance, sodded and sprigged turf shall have been freshly mowed within the last 48 hours. Turf shall be healthy, of uniform color and exhibiting good growth. A minimum of 100% of the specified turf area shall be covered in sod that has been installed for a minimum six weeks. Turf shall be 100% free of all weeds.
- D. Should the athletic field turf not be accepted on the date listed on the drawings the Owner will require the Landscape Contractor to place the field on a program of intensive cultural management in order to bring the fields to acceptance specification as quickly as possible. Actions may include sodding (minimum laid piece size – 1.5 ft. by 2 ft.) and any cultural activity which is suggested by the North Carolina Cooperative Extension Service as being of value in an intensive Bermuda grass management program. The Owner shall not be responsible for any additional costs associated with these actions.

- E. When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by Architect and found to be acceptable. Remove rejected plants and materials promptly from project site.

3.16 CLEANUP AND PROTECTION

- A. During landscaping, keep pavements clean and work area in an orderly condition.
- B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property unless an agreement is made with the Owner otherwise.

END OF SECTION 329000

SECTION 331000 – SITE WATER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes water systems piping for potable water service and fire protection service outside the building.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 15 Sections for fire protection systems inside building.
 - 2. Division 15 Sections for water distribution systems inside building.
 - 3. Division 31 Section “Earth Moving” for excavation, trenching, and backfilling.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure Ratings: Except where otherwise indicated, the following are minimum pressure requirements for water system piping.
 - 1. Underground Piping: 150 psi.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data, including pressure rating, rated capacity, and settings of selected models for the following:
 - 1. Backflow preventers.
 - 2. Valves and boxes.
 - 3. Identification materials and devices.
 - 4. Pipe and fittings.
 - 5. Backflow prevention devices and enclosures.
 - 6. Tapping sleeves and saddles.
- C. Shop drawings for precast concrete pits. Include frames and covers. Include drains when indicated.
- D. Coordination drawings showing pipe sizes and valves, meter and specialty locations and elevations, if applicable. Include details of underground structures, connections, anchors, and reaction backing. Show other piping in same trench and clearances from water system piping. Indicate interface and spatial relationship between piping and proximate structures.
- E. Record drawings at Project closeout of installed water system piping and products according to Division 1.
- F. As-Built survey of installed water system. Perform and submit as-built survey as soon as possible following installation of water piping and appurtenances. Survey shall be submitted at least 60-days prior to needed use of waterline.

- G. Test reports specified in "Field Quality Control" Article in Part 3. Submit test reports at least 60-days prior to needed use of waterline.

1.5 QUALITY ASSURANCE

- A. All materials, construction methods and testing shall comply with the requirements of the Town of Cary Standard Specifications and Details.
- B. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.
- C. Listing and Labeling: Provide equipment and accessories that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- D. Product Options: Water systems specialties and accessories are based on specific types, manufacturers, and models indicated. Components by other manufacturers but having equal performance characteristics may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by Architect and the Town of Cary. The burden of proof of equality and approval by the Town of Cary of products is on the Contractor. Refer to Division 1 sections.
- E. Perform As-Built Survey of installed water system piping and products according to Town of Cary As-Built drawing requirements. As-built survey shall be submitted in digital (dwg) and hard copy formats. The hard-copy shall be signed and sealed by a NC Professional Land Surveyor. Survey shall include the following:
 - 1. All fire hydrant water valve sizes and locations with no less than two primary reference dimensions from permanent above grade features.
 - 2. Locations of bacteriological sampling points.
 - 3. Pipe materials and sizes.
 - 4. Other water system components such as meters, backflow preventers, etc.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, for shipping as follows:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends, flange faces, and weld ends.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. Storage: Use the following precautions for valves, including fire hydrants, during storage:
 - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect valves from weather. Store valves indoors and maintain temperature higher than ambient dew point temperature. Support valves off ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

- E. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and piping specialties from moisture and dirt.
- G. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Verify that water system piping may be installed in compliance with original design and referenced standards.
- C. Site Information: Reports on subsurface condition investigations made during the design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate connection to water main with Town of Cary. Obtain all necessary permits for pavement cuts, line taps, etc. from the authorities having jurisdiction.
- B. Coordinate with pipe materials, sizes, entry locations, and pressure requirements of building fire protection and building water distribution systems piping.
- C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work are specified herein. Products by other manufacturers having equal performance characteristics may be considered, however approval must be acquired by the Contractor from the Town of Cary.

2.2 PIPES AND TUBES

- A. Copper Tube: ASTM B 88, Types K, seamless water tube, annealed temper. All copper pipe shall be NSF Listed for potable use.
- B. PVC Pipe: ASTM D 2241, SDR 21, gasket joints or ASTM D 1785, Sch-40, solvent joints. All PVC pipe shall be NSF Listed for potable use.

2.3 PIPE AND TUBE FITTINGS

- A. Copper Tube Fittings: AWWA C800, flared copper type brass fittings. All copper fittings shall be NSF Listed for potable use.
- B. PVC Plastic Fittings: ASTM D 2466, Sch-40. All PVC fittings shall be NSF Listed for potable use.

2.4 VALVES

- A. Non-rising Stem Gate Valves, 2 Inches and Smaller: MSS SP-80; body and screw bonnet of ASTM B 62 cast bronze; with Class 125 threaded ends, solid wedge, non-rising copper-silicon alloy stem, brass packing gland, polytetrafluoroethylene (PTFE)-impregnated packing, and malleable-iron handwheel.
- B. Curb Stop Ball Valves 2 Inches and Smaller: 300-psi, AWWA C800, certified low-lead per NSF. Bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material. Provide 2-inch wrench nut adapter on each valve.
- C. Valve Boxes: Cast-iron box having top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, boxes shall be of the screw or telescopic type, valve box ring adjustments will not be allowed. The valve box shall be centered over the wrench nut and seated on compacted backfill without touching the valve assembly. All valve boxes shall be encased in a trowel finished 2' x 2' x 6" pad of 3000-psi concrete beneath the asphalt with the cover flush with the top of the pavement or flush with the finished grade. Precast concrete valve box encasements may be used for valve box encasement outside of paved areas provided the assembly is buried flush with the surface grade and compacted properly to prevent movement of the precast encasement.
- D. Corporation Stops: Ball type, made of "no lead" brass (meeting UNS C89833 as per ASTM B584) and complete with a compression coupling and AWWA Standard threads as per AWWA C800. All corporation stops shall be rated for a working pressure of 300-psi.
 - 1. Taps shall be located at 10:00 or 2:00 o'clock on the circumference of the pipe. Service taps shall be staggered alternating from one side of the water main to the other and at least 12 inches apart. The taps must be a minimum of 24 inches apart if they are on the same side of the pipe.
 - 2. No burned taps will be allowed and each corporation stop shall be wrapped with Teflon tape for ductile iron pipe water mains. No taps are allowed on a fire hydrant line. No tapping shall be made where rodding is placed.
 - 3. Service Saddles shall be used on all ductile iron water mains for taps larger than 1-inch or otherwise when direct taps cannot be made. Service saddles shall be used for all taps on existing water mains other than ductile iron, such as asbestos cement, PVC, etc. Service Saddles shall be provided with brass body and fasteners (85-5-5-5 waterworks brass or "no lead" brass meeting UNS C89833 as per ASTM B584) conforming to AWWA C800 and double straps made of silicon bronze conforming to ASTM A98 and factory installed grade 60 rubber gaskets. Service saddles shall be provided with AWWA standard threads per AWWA C800.
- E. Ball Valve: PVC, quarter turn, true union ball valves. Rated to 200-psi., Teflon ball seats. Listed by NSF for use in potable water service.

2.5 BACKFLOW PREVENTERS

- A. Refer to Division 15 Sections.

2.6 IDENTIFICATION

- A. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."

PART 3 - EXECUTION

3.1 GENERAL

- A. All construction shall conform to the Standard Specifications and Details of the Town of Cary and the NCDOT as applicable in addition to the requirements state herein.

3.2 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.3 SERVICE ENTRANCE PIPING

- A. Extend water system piping and connect to water supply source and building water distribution and fire protection systems in locations and pipe sizes indicated.
 - 1. Terminate domestic water system piping at 5-feet outside building wall until building water systems are installed. Terminate piping with caps, plugs, or other fittings as required for piping material. Make connections to building water system when those systems are installed.

3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated except where deviations to layout are approved on coordination drawings.
- B. Install piping at indicated slope.
- C. Install components having pressure rating equal to or greater than system operating pressure.
- D. Install piping free of sags and bends.
- E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- F. Install fittings for changes in direction and branch connections.
- G. Piping Connections: Except as otherwise indicated, make piping connections as specified below within vaults or above-ground. Do not use flanges, unions or keyed couplings at underground installations.
 - 1. Above grade: Install unions, in piping 2 inches and smaller, adjacent to each valve and at final connection to each piece of equipment having 2-inch or smaller threaded pipe connection.
 - 2. Above grade: Install flanges, in piping 2-1/2 inches and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
 - 3. Below grade: Join copper pipe with flared copper type brass fittings.
 - 4. Below grade: Join ductile iron pipe with push-on joints. Join fittings with mechanical joints.
 - 5. Install dielectric fittings to connect piping of dissimilar metals.

3.5 PIPING INSTALLATION

- A. Water Main Connection: Tap water main with size and in location as indicated according to requirements of the Town of Cary.
 - 1. Install tapping sleeve and tapping valve according to manufacturer's installation instructions.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
 - 4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water service piping.
 - 5. Install service clamps and corporation stops in size, quantity, and arrangement required by Town of Cary standards and according to manufacturer's installation instructions.
 - 6. Install service clamps on pipe to be tapped. Position outlet for corporation stop.
 - 7. Install corporation stops into service clamps. Install valve with stem pointing up and with cast-iron valve box.
 - 8. Install curb stop in service piping with head pointing up and with cast-iron service box.

9. Install manifold for multiple taps in water main.
 10. Use drilling machine compatible with service clamp and corporate stop. Drill hole in main. Remove drilling machine and connect water service piping.
- B. Comply with requirements of NFPA 24 for materials and installation.
 - C. Install ductile-iron pipe and ductile-iron and cast-iron fittings according to AWWA C600.
 - D. Install copper tube and wrought-copper fittings according to CDA No. 404/0 "Copper Tube Handbook."
 - E. Bury piping at minimum depth of 3 feet below finished subgrade and not less than 18 inches below average local frost depth.
 - F. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
 - G. Shoring or bracing of pits, trenches and other excavations shall be in accordance with the requirements of NCDOT and OSHA.
 - H. The subgrade at the bottom of the trench shall be shaped to secure uniform support throughout the length of the pipe. A space shall be excavated under the bell of each pipe to provide space to relieve bearing pressure on the bell and provide room to adequately make the joint.
 - I. Open ends of pipe shall be plugged with a standard plug or cap at all times when pipe laying is not in progress. Trench water shall not be permitted to enter pipe.
 - J. Backfill material shall be free from stones greater than 4-inches in diameter, construction material debris, frozen material, organic matter, or unstable material. Backfill materials shall be placed in loose lifts of 8-inches or less in depth. All backfill shall be compacted to not less than 95% of the standard Proctor maximum dry density except the final foot beneath pavement or slab areas where this requirement shall be increased to 98% of the standard Proctor maximum dry density.
 - K. Install and test fire protection piping and appurtenances in accordance with the specific requirements of the Town of Cary and applicable NFPA requirements.

3.6 BACKFLOW PREVENTER INSTALLATION

- A. Refer to Division 15 Sections.

3.7 IDENTIFICATION INSTALLATION

- A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 inches to 8 inches below finished grade, directly over piping.

3.8 FIELD QUALITY CONTROL

- A. General: All materials shall be inspected by the Town's inspector prior to installation. The Contractor shall furnish all materials, labor and equipment to perform all testing and inspections. The Town of Cary shall provide water for testing purposes on waterlines in accordance with Town Standard Procedure 4, Control and Monitoring of Water System Flow Activity.
- B. Hydrostatic Testing:
 1. No valve in the Town water system shall be operated without authorization in accordance with the Town Standard Procedure 4, "Control and Monitoring of Water System Flow Activity." A section of line that is to be hydrostatically tested, shall be slowly filled with water at a rate which will allow complete evacuation of air from the line. Hand pumps shall not be used for the pressure

- testing of waterlines. Taps used for testing purposes shall be removed after testing and repaired using a stainless steel full circle repair clamp.
2. Fill the line slowly to avoid undue impacts associated with surge and to allow air to evacuate the pipeline. After all air has been expelled from the waterline, the line shall be tested to a pressure of 200 psi as measured at the lowest elevation of the line for a duration of 2 hours. The testing period shall not commence until all air has been evacuated and the pressure has stabilized. The pressure gauge used in the hydrostatic test shall be calibrated in increments of 10-psi or less. The pressure gauge shall be liquid-filled and indexed for an operating range of 300-psi or less with a minimum dial size of 3-1/2 inches. At the end of the test period, the leakage shall be measured with an accurate water meter.
 3. Any measured leakage shall require repair of the waterline and additional testing. All visible leaks shall be repaired regardless of the amount of leakage.
- C. Disinfection: All additions or replacements to the water system shall be disinfected with chlorine in conformance with AWWA C651 before being placed in service under the supervision of the Town's Inspector in the following manner.
- D. Flushing:
1. Flushing of lines may only proceed after 24 hours of disinfection contact time and as directed by Town staff, provided the free residual chlorine analysis is satisfactory.
 2. Water used for disinfection shall be flushed from the waterline until the chlorine residual concentration is below 5-ppm before initiating sampling.
- E. Bacteriological and Turbidity Sampling
1. Bacteriological sampling shall be utilized to verify disinfection prior to placing a newly constructed waterlines in operational service. Bacteriological sampling shall consist of 2 consecutive sets of acceptable samples taken at least 24-hours apart.
 2. For the first round of sampling, the requested laboratory analysis shall be specified as follows: "Bacteriological Test and Turbidity." For the second round of testing, the laboratory analysis shall be specified as, "Bacteriological Test Only."
 3. Samples for laboratory analysis shall be collected by the Town's Inspector after flushing is completed. The Contractor shall furnish the sample bottles, the testing agency and such help as may be required to secure these samples. The contractor shall make arrangements with the laboratory that all test results be submitted directly to the Town's inspector or other designee approved by the Engineering Inspector. All costs for laboratory testing shall be borne by the Contractor.
 4. The laboratory secured for testing shall be certified by the State Laboratory of Public Health. All sample bottles for bacteriological sampling provided by the laboratory shall be sterilized and treated with a dechlorinating agent, such as sodium thiosulfate. Samples for turbidity shall be taken in plain sterilized bottles from the lab, which are separate from the bottles provided for bacteriological testing. The sample bottles shall be provided with tamper proof seals that will be adhered to the bottles by the Town's inspector. The inspector shall provide a sample identification number, job title and an identification of Phase 1 or Phase 2 sampling that will be provided on the tamper proof custody seal. The bottles and tamper proof custody seals shall be accompanied by a chain of custody form provided by the certified laboratory conducting the testing. All sample identification numbers, job titles, and Phase 1 or Phase 2 testing identification from the custody seal shall be recorded on the chain of custody forms by the Engineering Inspector.
 5. All samples shall be collected in compliance with the sampling protocols provided by the certified laboratory and processed for delivery under the direct supervision of the Engineering Inspector. The samples shall be collected by the Town's inspector or designee and kept in a cooler provided by the Contractor at approximately 40-degrees Fahrenheit or 4-degrees Celsius and delivered to the certified lab for testing as soon as possible. The time at which the sample is taken shall be recorded on the chain of custody form by the Engineering Inspector. Any samples processed at the laboratory more than 30-hours following collection shall be declared invalid, i.e. samples shall be submitted to the lab within 24-hours of collecting them.

6. All first round samples shall be tested for bacteriological quality and turbidity in accordance with standards established by NCDENR and AWWA. If turbidity exceeds 0.8 NTU, the sample shall fail and the system shall be re-flushed before initiating a new round of testing.
7. If the phase 1 sample results for bacteriological quality and turbidity are acceptable, then a second set of samples can be collected at least 24-hours following the first sample collection. No additional flushing other than required to obtain a representative sample will be allowed prior to collecting the second set of samples.
8. The second set of samples shall be tested for bacteriological quality only. All custody seals and chain of custody forms shall identify the second round samples as “Phase 2” testing to notify the lab that the first set of samples have already been evaluated and received a satisfactory laboratory analysis.
9. At the completion of sampling, the total chlorine concentration shall be at least 2-mg/L and no higher than 4-mg/L before the system can be made operational.
10. If test results are unsatisfactory, the Contractor shall immediately re-chlorinate lines and proceed with such measures as are necessary to properly disinfect the lines.
11. The new water system shall be valved off from the existing system until a satisfactory bacteriological laboratory analysis has been obtained and the Inspector has authorized the use of the new water system.

F. Backflow Prevention Device Certification

1. All new or relocated backflow prevention devices shall be tested and certified by a licensed inspector prior to operation of the water system. Performance, coordination and submittal of documentation of the testing and certification shall be the responsibility of the Contractor.

- G. Contractor shall be responsible for ensuring all waterlines are fully flushed and free of all deleterious matter prior to connecting to the building plumbing system.

END OF SECTION 331000

SECTION 333000 - SITE SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes sewerage systems outside the building.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Division 3 Section "Cast-in-Place Concrete" for cast-in-place concrete structures.
 - 2. Division 15 Sections for sanitary sewer systems inside and adjacent to building, including grease interceptors.

1.3 DEFINITIONS

- A. Sewerage Piping: System of sewer pipe, fittings, and appurtenances for gravity flow of sanitary sewage.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for the following:
 - 1. Cleanouts.
 - 2. Pipe and fittings.
 - 3. Couplings.
 - 4. Manhole Apurtenances.
- C. Record drawings at Project closeout of installed water system piping and products according to Division 1.
- D. As-Built survey of installed sanitary sewer mains and manholes. Perform and submit as-built survey as soon as possible following installation of manholes and sewer main piping. Survey shall be submitted at least 60-days prior to needed use of sewer main.
- E. Inspection and test reports specified in the "Field Quality Control" Article.

1.6 QUALITY ASSURANCE

- A. Environmental Agency Compliance: Comply with regulations pertaining to sanitary sewerage systems.
- B. Utility Compliance: Comply with Town of Cary regulations pertaining to sanitary sewerage systems.
- C. Product Options: Drawings indicate sizes, profiles, connections, and dimensional requirements of system components and are based on specific manufacturer types indicated. Other manufacturers' products with

equal performance characteristics may be considered. Refer to Division 1 Section "Product Substitutions."

- D. Perform As-Built Survey of installed sewer system piping and products according to Town of Cary As-Built drawing requirements. As-built survey shall be signed and seal by a NC Professional Land Surveyor and shall include the following:
 - 1. All manhole invert and rim elevations and horizontal locations with no less than two primary reference dimensions from permanent above grade features.
 - 2. All cleanout locations with no less than two primary reference dimensions from permanent above grade features.
 - 3. Pipe materials, sizes, lengths, and slopes.
 - 4. Other sewer system components such as grease traps, etc.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures in direct sunlight.
- B. Do not store plastic pipe or fittings in direct sunlight.
- C. Protect pipe, pipe fittings, and seals from dirt and damage.
- D. Handle precast concrete manholes and other structures according to manufacturer's rigging instructions.

1.8 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.
 - 1. Notify Architect not less than 48 hours in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without receiving Architect's written permission.

1.9 SEQUENCING AND SCHEDULING

- A. Coordinate sanitary sewerage system connections to utility company's sanitary sewer. Obtain all necessary permits for pavement cuts, line taps, etc. from the authorities having jurisdiction.
- B. Coordinate force main connection to existing force main with Owner.
- C. Coordinate with interior building drainage systems.
- D. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work are specified herein. Products by other manufacturers having equal performance characteristics may be considered, however approval must be acquired by the Contractor from the Town of Cary.

2.2 PIPES AND FITTINGS

- A. Ductile-Iron Gravity Sewer Pipe & Fittings: AWWA C150 and C151, Pressure Class 350 with laying condition Type 1 (Type 4 for installations of greater than 16-ft of cover).
 - 1. Lining: AWWA C104, cement mortar, bituminous seal coated.
 - 2. Gaskets, Glands, and Bolts and Nuts: AWWA C111.
 - 3. Push-On-Joint-Type Pipe: AWWA C111, rubber gaskets.
 - 4. Mechanical-Joint-Type Pipe: AWWA C111, rubber gaskets, ductile- or cast-iron glands, and steel bolts and nuts.
 - 5. Standard-Pattern, Ductile-Iron and Cast-Iron Fittings: AWWA C110, for push-on joints.
 - 6. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.
 - 7. Coating: AWWA C151, bituminous coating.
- B. Polyvinyl Chloride (PVC) Gravity Sewer Service Pipe and Fittings: PVC service pipe shall be 4-in or 6-in, schedule 40 or greater supplied in minimum 18-ft lengths. Schedule 40 PVC pipe shall be manufactured with a cell classification of 12454 in conformance with ASTM D1784. Schedule 40 pipes shall be manufactured to dimensional tolerances as specified in ASTM D1785 and rated for service conditions up to temperatures of 140-degrees Fahrenheit. The pipe may be joined by solvent weld in conformance with ASTM D2564.

2.3 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Sleeve-Type Pipe Couplings: Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined, for nonpressure joints.
 - 1. Sleeves for Cast-Iron Soil Pipe: ASTM C 564, rubber.
 - 3. Sleeves for Plastic Pipe: ASTM F 477, elastomeric seal.
 - 4. Sleeves for Dissimilar Pipes: Compatible with pipe materials being joined.
 - 5. Bands: Stainless steel, at least one at each pipe insert.

2.4 CLEANOUTS

- A. Description: ASME A112.36.2M, round, cast-iron housing with clamping device and round, secured, scoriated, cast-iron cover. Include cast-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:
 - 1. Light Duty: In earth or grass, foot-traffic areas.
 - 2. Medium Duty: In paved, foot-traffic areas.
 - 3. Heavy Duty: In vehicle-traffic service areas.
 - 4. Extra Heavy Duty: In roads.
- B. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, service class, cast-iron soil pipe and fittings.
- C. Cleanout Box: Cleanouts located in paved areas subject to vehicular traffic shall be protected by an 8-in diameter, ductile-iron cleanout box. 'SEWER' or 'C.O.' marking shall be cast into the lid.

2.5 MANHOLES CONNECTORS

- A. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

2.6 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
 - 1. Cement: ASTM C 150, Type II.

2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Structures: Portland-cement design mix, 4000 psi minimum, with 0.45 maximum water-cement ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615, Grade 60, deformed steel.
- C. Structure Channels and Benches: Factory or field formed from concrete. Portland-cement design mix, 4000 psi minimum, with 0.45 maximum water-cement ratio.

PART 3 - EXECUTION

3.1 GENERAL

- A. All construction shall conform to the Standard Specifications and Details of the Town of Cary and the NCDOT as applicable in addition to the requirements state herein.

3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.3 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground structures.
1. Use detectable warning tape over nonferrous piping and over edges of underground structures. Locate 6 inches to 24 inches below finished grade, directly over piping.

3.4 SEWERAGE PIPING APPLICATIONS

- A. General: Include watertight joints.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products. Refer to the drawings type of pipe to be installed.

3.5 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of underground sewerage piping. Location and arrangement of piping layout take into account many design considerations. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- C. Use proper size increasers, reducers, and couplings, where different sizes or materials of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
- D. Install gravity-flow-systems piping at constant slope between points and elevations indicated. Install straight piping runs at constant slope, not less than that specified, where slope is not indicated.
- E. Extend gravity sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

- F. Install gravity sewerage piping pitched down in direction of flow, at minimum and cover as indicated.
- G. Tunneling: Install pipe under streets or other obstructions, that cannot be disturbed, by tunneling, jacking, or a combination of both.
- H. PVC Sewer Service Pipe shall be installed at no less than 4-ft of cover and shall be installed with 4-in minimum stone bedding extended to the springline. PVC sewer service pipe installed with greater than 8-ft of cover shall be bedded on 6-in of stone extended above the pipe crown.
 - 1. Ductile iron pipe shall be used for sanitary sewer services with less than 4-ft of cover or in excess of 20-ft of cover.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to the following.
- B. Ductile-Iron Pipe with Ductile-Iron or Cast-Iron Fittings: With push-on-joint, rubber gaskets according to AWWA C600.
- D. Polyvinyl Chloride (PVC) Plastic Pipe and Fittings: Installation of PVC pipe shall follow the recommendations of ASTM D-2321 "Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications". For PVC pipe installation, bedding and embedment material shall be Class I, typically No. 67 or No. 78 washed stone. Bedding and embedment materials for PVC gravity sewers other than No. 67 or No. 78 washed stone shall be approved by the Town of Cary prior to use.
 - 1. Typical Bedding and Embedment for SDR35 PVC Gravity Sewers, 4-ft to 14-ft in Depth: Bedding shall consist of minimum 4-inches of No. 67 or No. 78 stone installed under the pipe extending up to the springline. Bedding and embedment shall be compacted to 95% standard proctor density. Careful attention shall be placed on compacting embedment under the haunches of the pipe to prevent any potential voids.
 - 2. Typical Bedding and Embedment for SDR26 PVC Gravity Sewers, 14-ft to 30-ft in Depth: Bedding shall consist of minimum 6-inches of No. 67 or No. 78 stone installed under the pipe extending 6-inches above the crown of the pipe. Bedding and embedment shall be compacted to 95% standard proctor density. Careful attention shall be placed on compacting embedment under the haunches to prevent any potential voids.
 - 3. The bedding and embedment materials shall be in accordance with ASTM D-2321. The embedment materials shall be installed from trench wall to trench wall.
 - 4. The maximum allowable deflection after installation shall BE LESS THAN 5% for PVC pipe.

3.7 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Sewer cleanouts located in paved areas, which bear vehicle loading, must have ductile iron risers, ductile iron fittings and traffic rated cast iron cover assembly.
- B. Set cleanout frames and covers in earth in a cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade. Precast cleanout collars shall not be used.
- C. In Paved Areas: Cleanouts shall be installed within a protective cleanout box set flush with surface of paving.

3.8 FIELD QUALITY CONTROL – GRAVITY SEWER

- A. Coordinate testing of sanitary sewer service line with Town of Cary inspector.

END OF SECTION 333000

