Project Number 21335

Ebenezer Park Phase II Improvements

Date: June 06, 2023

OWNER: YORK COUNTY
ENGINEERING DEPARTMENT
PO BOX 148
6 SOUTH CONGRESS STREET
YORK, SOUTH SC 29745
(803) 684-8571
(803) 684-8596 FAX

York County Council
Christi Cox, Chairman
Allison Love, Vice Chair
William Roddey
Tom Audette
Tommy Adkins
A Watts Huckabee, Sr.
Debi Cloniger

York County Manager
David Hudspeth, Manager
Kevin Madden, Assistant Manager
Michael Moore, Assistant Manager

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BID BOND

STATE OF SOUTH CAROLINA
COUNTY OF YORK

KNOW ALL MEN BY THESE PRESENTS, that _____ as Principal, and _____, as Surety, a Corporation chartered and existing under the laws of the State of _____, with its principal offices in the City of_____, and authorized to do business in the State of South Carolina are held and firmly bound unto the OWNER, _____ in the penal Sum of _____ _____Dollars ($_____) lawful money of the United States, for the payment of which sum will 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 has submitted to the OWNER the accompanying bid, dated _____, *20*___, for:

Improvements to Ebenezer Park Phase II

NOW, THEREFORE,

A. If said Bid shall be rejected, or

B. If the principal shall not withdraw said Bid within twenty-four (24) hours after date of opening of the same, and shall within ten (10) days after the prescribed forms are presented to him for signature, enter into a written contract with the OWNER in accordance with the Bid as accepted, and give bonds with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such contract, then the above obligations shall be void and of no effect, otherwise to remain in full force and effect.

C. In the event of the withdrawal of said Bid within the period specified, or the failure to enter into such contract and give such bonds within the time specified, if the principal shall pay the OWNER the difference between the amount specified in said bid and the amount for which the OWNER may procure the required work and supplies, if the latter amount be in excess of the former, then the above obligations shall be void and of no effect, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under their several seals, this ____ day of _ _____, A.D., *20*___, 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.

WITNESS: (If Sole Ownership or Partnership, two (2) Witnesses required).
(If Corporation, Secretary only will attest and affix seal).

WITNESSES: PRINCIPAL:

_____ _____
Name of Firm

_____ _____
Signature of Authorized Officer

(Affix Seal)

Title

Business Address

City State

WITNESS:

SURETY:

Corporate Surety

(Affix Attorney-in-Fact Seal)

Business Address

City State

Name of Local Insurance Agency

CERTIFICATES AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the Secretary of the Corporation named as Principal in the within bond; that _____who signed the said bond on behalf of the principal, was then _____ _____ of said corporation; that I know his signature, and his signature hereto is genuine; and that said bond was duly signed, sealed, and attested for and in behalf of said corporation by authority of its governing body.

(Corporate Secretary Seal)

STATE OF SOUTH CAROLINA
COUNTY OF YORK

Before me, a Notary Public duly commissioned, qualified and acting, personally appeared _____ _____to me well known, who being by me first duly sworn upon oath, says that he is the Attorney-in-Fact, for the _____ _____ and that he has been authorized by _____ to execute the foregoing bond on behalf of the Contractor named therein in favor of the OWNER, the _____ _____.

Subscribed and sworn to before me this ____ day of_____, *20*___, A.D.

(Attach Power of Attorney
to original Bid Bond)

_____
Notary Public
State of South Carolina-at-Large

My Commission Expires:_____

END OF SECTION 004313

NON-COLLUSION AFFIDAVIT

State of _____)

County of _____)

_____, being first duly sworn, deposes and says that:

(1) He is _____ of _____, the Bidder
Title Company Name
that has submitted the attached Bid;

(2) He is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

(3) Such Bid is genuine and is not a sham Bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has 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 in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other bidder, or to secure through any collusion, conspiracy, conveyance or unlawful agreement any advantage against the OWNER 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 of its agents, representatives, owners, employees, or parties in interest, including this affidavit.

(Signed) _____

_____
(Title)

Subscribed and sworn to before me

this ____ day of _____, 20_____

_____
(Title)

My commission expires _____

END OF SECTION 004519

NOTICE OF AWARD

TO: _____

_____

_____

FROM: York County Engineering

P.O. Box 148

York, SC 29745

PROJECT TITLE: Improvements to Ebenezer Park Phase II

PROJECT DESCRIPTION
Ebenezer Park Phase II Improvements include the replacement of 2 restroom/shower buildings, 13 new campsites, campsite improvements, campsite driveway paving, road widening, new parking, existing parking improvements, and utility work.

The Owner has considered the Bid submitted by you for the above-described work in response to its Advertisement for Bids dated _____ and Information for Bidders.

You are hereby notified that your Bid has been accepted for items in the amount of
(spell out amount) _____).

You are required by the Information for Bidders to execute the Agreement and furnish the required Contractor's Performance Bond, Payment Bond and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said Bonds within ten (10) days from the date of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Bid as abandoned and as forfeiture of your Bid Bond. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice of Award to the Owner.

Dated this _____ day of _____, *2023.*

On behalf of the York County Council

By: _____

Title: County Engineer

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award is hereby acknowledged

By: _____

Title: _____

This _____day of _____,*2023.*

END OF SECTION 005100

AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of _____, *2023*_ A.D., by and between the York County Government, party of the first part (hereinafter sometimes called the "OWNER"), and _____, party of the second part (hereinafter sometimes called the "CONTRACTOR").

WITNESSETH: That the parties hereto, for the consideration hereinafter set forth, mutually agree as follows:

1. SCOPE OF THE WORK

1.1. The CONTRACTOR shall furnish all labor, materials, equipment, machinery, tools, apparatus, and transportation and perform all of the Work shown on the Drawings and described in the Specifications entitled:

Name of project: Improvements to Ebenezer Park Phase II

as prepared by York County Engineering Department acting as, and in the Contract, Documents entitled the ENGINEER, and shall do everything required by this Contract and the other Contract Documents.

2. THE CONTRACT SUM

2.1. The OWNER shall pay to the CONTRACTOR for the faithful performance of the Contract, in lawful money of the United States, and subject to addition and deductions as provided in the Contract Documents, a total sum as follows:

Based upon the prices shown in the Bid heretofore submitted to the OWNER by the CONTRACTOR, a copy of said Proposal being a part of these Contract Documents, the aggregate amount of this Contract (obtained from either the lump sum price, the application of unit prices to the quantities shown in the Bid, or the combination of both) being the sum of

Spell out amount($).

3. COMMENCEMENT AND COMPLETION OF WORK

3.1. The CONTRACTOR shall commence Work and the Contract Time will commence to run on the date fixed in the Notice to Proceed.

3.2. The CONTRACTOR shall prosecute the Work with faithfulness and diligence and shall be completed and ready for final payment within ***288 Calendar days*** after commencement date fixed in the Notice to Proceed.

4. CONTRACTOR'S ACCEPTANCE OF CONDITIONS

4.1. The CONTRACTOR hereby agrees that, by virtue of submitting a completed Bid including his declarations therein of full satisfaction, knowledge and understanding of the Contract Documents, site conditions (surface and subsurface) and all other conditions affecting the Work, he assumes full responsibility for performance of the Work as required under this Contract. It is expressly agreed that under no circumstances, conditions or situations shall this Contract be more strongly construed against the OWNER than against the CONTRACTOR and his Surety.

4.2. It is understood and agreed that the passing, approval and/or acceptance of any part of the Work or material by the OWNER, ENGINEER, or by any agent or representative, as being in compliance with the terms of this Contract and/or of the Contract Documents, shall not operate as a waiver by the OWNER of strict compliance with the terms of this Contract, and/or the Contract Documents covering said Work; and the OWNER may require the CONTRACTOR and/or his surety to repair, replace, restore and/or make to comply strictly and in all things with this Contract and the Contract Documents any and all of said Work and/or materials which within a period of two years from and after the date of the acceptance of any such Work or material, are found to be defective or to fail in any way to comply with this Contract or with the Contract Documents. This provision shall not apply to materials or equipment normally expected to deteriorate or wear out and become subject to normal repair and replacement before their condition is discovered.

Failure on the part of the CONTRACTOR and/or his Surety, immediately after notice to either, to repair or replace any such defective materials and workmanship shall entitle the OWNER, if it sees fit, to replace or repair the same and recover the reasonable cost of such replacement and/or repair from the CONTRACTOR and/or his surety, who shall in any event be jointly and severally liable to the OWNER for all damage, loss and expense caused to the OWNER by reason of the CONTRACTOR's breach of this Contract and/or his failure to comply strictly and in all things with this Contract.

5. LIQUIDATED DAMAGES

5.1. It is mutually agreed that time is of the essence of this Contract and should the CONTRACTOR fail to complete the work within the specified time, or any authorized extension thereof, there shall be deducted from the compensation otherwise to be paid to the CONTRACTOR, and the OWNER will retain the amount of *Five Hundred Dollars ($500.00)* per calendar day as fixed, agreed, and liquidated damages for each calendar day elapsing beyond the specified time for substantial completion or any authorized extension thereof, which sum shall represent the actual damages which the OWNER will have sustained by failure of the CONTRACTOR to complete the work within the specified time. After substantial completion, if the CONTRACTOR shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by OWNER, Contractor shall pay OWNER *Five Hundred Dollars ($500.00)* for each calendar day that expires after the date specified for Final Completion and readiness for final payment until the work is complete and ready for final payment. It being further agreed that said sum is not a penalty but is the stipulated amount of damages sustained by the OWNER in the event of such default by the CONTRACTOR.

5.2. For the purposes of this Article, the day of final acceptance of the Work shall be considered a day of delay, and the scheduled day of completion of the work shall be considered a day scheduled for production.

6. PARTIAL AND FINAL PAYMENTS

6.1. In accordance with the provisions fully set forth in the General Conditions, and subject to additions and deductions as provided, the OWNER shall pay the CONTRACTOR as follows:

6.1.1. Within 30 days after receipt by the OWNER of the CONTRACTOR's request for partial payment, the OWNER shall make partial payments to the CONTRACTOR, on the basis of the estimate of Work as approved by the ENGINEER, for work performed during the preceding calendar month, less ten percent (10%) of the amount of such estimate which is to be retained by the OWNER until all Work has been performed strictly in accordance with this Agreement and until such Work has been accepted by the OWNER.

6.1.2. Upon submission by the CONTRACTOR of evidence satisfactory to the OWNER that all payrolls, material bills and other costs incurred by the CONTRACTOR in connection with the construction of the Work have been paid in full, including all retainage to subcontractors on the project, and also after all guarantees that may be required in the specifications have been furnished and are found acceptable by the OWNER, final payment on account of this Agreement shall be made within sixty (60) days after completion by the CONTRACTOR of all Work covered by this Agreement and acceptance of such Work by the OWNER.

6.1.3. Retainage will be released in full at Final Completion.

7. ADDITIONAL BOND

7.1. It is further mutually agreed between the parties hereto that if, at any time after the execution of this Agreement and the Performance and Payment Bonds hereto attached for its faithful performance, the OWNER shall deem the surety or sureties upon such bonds to be unsatisfactory, or if, for any reason, such bond(s) ceases to be adequate to cover the performance of the Work, the CONTRACTOR shall, at his expense, and within three days after the receipt of notice from the OWNER to do so, furnish an additional bond or bonds, in such form and amount, and with such sureties as shall be satisfactory to the OWNER. In such event, no further payment to the CONTRACTOR shall be deemed due under this Agreement until such new or additional security for the faithful performance of the Work shall be furnished in manner and form satisfactory to the OWNER.

8. CONTRACT DOCUMENTS

8.1. The Contract Documents, as stated in the Instructions to Bidders, including this Project Manual and General Conditions, and the accompanying Contract Drawings, shall form the Contract and are as fully a part of this Contract as if herein repeated.

IN WITNESS WHEREOF the parties hereto have executed this Agreement on the day and date first above written in three (3) counterparts, each of which shall, without proof or accounting for the other counterparts, be deemed an original Contract.*

Owner	Contractor
By:_____	By:_____
[Corporate Seal]	[Corporate Seal]
Attest:_____	Attest:_____
Address for giving notices:	Address for giving notices:
	License No._____
	Agent for service of process:_____

(*) In the event that the CONTRACTOR is a Corporation, a certificate of resolution of the Board of Directors of the Corporation, authorizing the officer who signs the Contract to do so in its behalf shall be completed and submitted with this form.

END OF SECTION 005200

NOTICE TO PROCEED

Date: _____

To: _____

_____

_____

Project:

Name of Project: Improvements to Ebenezer Park Phase II

You are hereby notified to commence work in accordance with the Agreement dated _____ on or before , and you are to complete the work within **288 consecutive** calendar days thereafter. The date of completion of all work is therefore June 28, 2024.

On behalf of the

YORK COUNTY GOVERNMENT

By: _____

Title: _____

ACCEPTANCE OF NOTICE

Receipt of the above Notice to Proceed is hereby acknowledged by _____, this the ____day of _____, ***20***___.

By: _____

Title: _____

PERFORMANCE AND INDEMNITY BOND

STATE OF SOUTH CAROLINA
COUNTY OF YORK

KNOW ALL MEN BY THESE PRESENTS that _____ _____ as Principal, hereinafter called Contractor, and _____ _____as Surety, hereinafter called Surety, are held and firmly bound unto the York County Government, as Obligee, hereinafter called owner, in the amount of _____ _____Dollars ($_____ _____) for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated_____, *20___*, entered into a Contract with Owner for:

Name of Project: Improvements to Ebenezer Park Phase II

in accordance with Drawings and Specifications prepared by York County Engineering Department, ENGINEER, which Contract is by reference made a part hereof and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH, that, if the Principal shall in all respects promptly and faithfully perform and comply with the terms and conditions of said Contract and his obligations thereunder and shall indemnify the OWNER and the ENGINEER and save either or all of them harmless against and from all costs, expenses and damages arising from the performance of said Contract or the repair of any work thereunder, then this obligation shall be void; otherwise, this Bond shall remain in full force and effect, in accordance with the following terms and conditions:

A. The Principal and Surety jointly and severally agree to pay the OWNER any difference between the sum to which the said Principal would be entitled on the completion of the Contract, and that sum which the OWNER may be obliged to pay for the completion of said work by Contract or otherwise, and any damages, direct or indirect or consequential, which the said OWNER may sustain on account of such work, or on account of the failure of said CONTRACTOR to properly and in all things, keep and execute all of the provisions of said Contract.

B. And this Bond shall remain in full force and effect for a period of one (1) year from the date of final payment of the project by the OWNER and shall provide that the CONTRACTOR guarantees to repair or replace for said period of one (1) year all work performed and materials and equipment furnished that were not performed or furnished according to the terms of the Contract, and shall make good, defects thereof which have become apparent before the expiration of said period of two (1) year. If any part of the project, in the judgment of the OWNER, for the reasons above stated needs to be replaced, repaired or made good during that time, the OWNER shall so notify the CONTRACTOR in writing. If the CONTRACTOR refuses or neglects to do such work within five (5) days from the date of service of such Notice, the OWNER shall have the work done by others and the cost thereof shall be paid by the CONTRACTOR or his Surety.

C. And the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligations on this bond, and it does hereby waive Notice of any change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Specifications.

D. The surety represents and warrants to the OWNER that they have a minimum Best's Key Rating Guide General Policyholder's Rating of "A –" and Financial Category of "Class VIII".

IN WITNESS WHEREOF, the above bounded parties executed this instrument under their several seals, this ____ day of _____ *20*___, A.D., 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.

WITNESS: (If Sole Ownership or Partnership, two (2) Witnesses required).
(If Corporation, Secretary only will attest and affix seal).

PRINCIPAL:

_____

_____
Signature of Authorized Officer
(Affix Seal)

WITNESSES:

_____ _____
Title

_____ _____
Business Address

_____
City State

SURETY:

WITNESS: _____
Corporate Surety

_____ _____
Attorney-in-Fact (Affix Seal)

_____
Business Address

_____
City State

_____
Name of Local Insurance Agency

CERTIFICATES AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the Secretary of the Corporation named as Principal in the within bond; that _____ who signed the said bond on behalf of the Principal, was then _____ _____ of said Corporation; that I know his signature, and his signature hereto is genuine; and that said bond was duly signed, sealed, and attested for and in behalf of said Corporation by authority of its governing body.

_____
Secretary

Corporate
Seal

STATE OF SOUTH CAROLINA

COUNTY OF YORK

Before me, a Notary Public, duly commissioned, qualified and acting, personally appeared _____ _____ to me well known, who being by me first duly sworn upon oath, says that he is the Attorney-in-Fact, for the __ _____ _____ and that he has been authorized by _____ to execute the foregoing bond on behalf of the Contractor named therein in favor of the_____ _____.

Subscribed and sworn to before me this _____ day of _____, *20*___, A.D.

(Attach Power of Attorney)

_____
Notary Public
State of South Carolina-at-Large

My Commission Expires:

END OF SECTION 006113.13

PAYMENT BOND

STATE OF SOUTH CAROLINA
COUNTY OF YORK

KNOW ALL MEN BY THESE PRESENTS that _____ _____ as Principal, hereinafter called CONTRACTOR, and _____ _____ as Surety, hereinafter called Surety, are held and firmly bound unto the York County Government, as Obligee, hereinafter called OWNER, in the amount of _____ _____ _____Dollars($_____) for the payment whereof CONTRACTOR and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, CONTRACTOR has by written agreement dated_____, *20__*, entered into a Contract with OWNER for:

Improvements to Ebenezer Park Phase II

in accordance with Drawings and Specifications prepared by York County Engineering Department, ENGINEER, which Contract is by reference made a part hereof and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH, that, if the Principal shall promptly make payments to all claimants, as herein below defined, then this obligation shall be void; otherwise, this Bond shall remain in full force and effect, subject to the following terms and conditions:

A. A claimant is defined as any person supplying the Principal with labor, material and supplies, used directly or indirectly by the said Principal or any subcontractor in the prosecution of the work provided for in said Contract.

B. The above named Principal and Surety hereby jointly and severally agree with the OWNER that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after performance of the labor or after complete delivery of materials and supplies by such claimant, may sue on this Bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The OWNER shall not be liable for the payment of any costs or expenses of any such suit.

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

1. Unless claimant, other than one having a direct contract with the Principal, shall within forty-five (45) days after beginning to furnish labor, materials or supplies for the prosecution of the work, furnish the Principal with a notice that he intends to look to this bond for protection.

2. Unless claimant, other than one having a direct contract with the Principal, shall within ninety (90) days after such claimant's performance of the labor or complete delivery of materials and supplies, deliver to the Principal written notice of the performance of such labor or delivery of such material and supplies and the nonpayment, therefore.

3. After the expiration of one (1) year from the performance of the labor or completion of delivery of the materials and supplies; it being understood, however, that if any limitation embodied in this

Bond is prohibited by any law controlling the construction hereof such limitations shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

4. Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.

D. The Principal and the Surety jointly and severally, shall repay the OWNER any sum which the OWNER may be compelled to pay because of any lien for labor or materials furnished for any work included in or provided by said Contract.

E. The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration of or addition to the terms of the Contract or to the work to be performed thereunder or the Specifications applicable thereto shall in any way affect its obligations on this Bond, and the Surety hereby waives notice of any such change, extension of time, alterations of or addition to the terms of the Contract, or to the work or to the Specifications.

F. The Surety represents and warrants to the Owner that they have a minimum Best's Key Rating Guide General Policyholder's rating of "A –" and Financial Category of "Class VIII".

IN WITNESS WHEREOF, the above bounded parties executed this instrument under their several seals, this _____ day of _____ *20___*, A.D., 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.

WITNESS: (If Sole Ownership or Partnership, two (2) Witnesses required).
(If Corporation, Secretary only will attest and affix seal).

PRINCIPAL:

_____

_____
Signature of Authorized Officer
(Affix Seal)

WITNESSES:

_____ _____
Title

_____ _____
Business Address

_____
City State

SURETY:

WITNESS:

_____
Corporate Surety

_____ _____
Attorney-in-Fact

(Affix Seal)

_____
Business Address

_____
City State

_____
Name of Local Insurance Agency

CERTIFICATES AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the Secretary of the Corporation named as Principal in the within bond; that _____ who signed the said bond on behalf of the Principal, was then _____ of said Corporation; that I know his signature, and his signature hereto is genuine; and that said bond was duly signed, sealed, and attested for and in behalf of said Corporation by authority of its governing body.

_____
Secretary

Corporate
Seal

STATE OF SOUTH CAROLINA

COUNTY OF YORK

Before me, a Notary Public, duly commissioned, qualified and acting, personally appeared _____ _____ to me well known, who being by me first duly sworn upon oath, says that he is the Attorney-in-Fact, for the _____ _____ and that he has been authorized by _____ to execute the foregoing bond on behalf of the CONTRACTOR named therein in favor of the_____ _____.

Subscribed and sworn to before me this ____ day of _____, *20*___, A.D.

(Attach Power of Attorney)

_____
Notary Public
State of South Carolina-at-Large

My Commission Expires: _____

END OF SECTION 006113.16

CONTRACT CHANGE ORDER

CHANGE ORDER NO:_____

PROJECT: Improvements to Ebenezer Park Phase II

DATE OF ISSUANCE:

DESCRIPTION OF CHANGE:

_____

_____

_____

CONTRACT AMOUNT		CONTRACT TIME (Calendar Days)	
Original	$ 0	Original Durations	0 Days
Previous Change Orders (Add/Deduct)	$ 0	Previous Change Order (Add/Deduct)	0 Days
This Change Order (Add/Deduct)	$ 0	This Change Order (Add/Deduct)	0 Days
Revised Contract Amount	$ 0	Revised Contract Time	0 Days
		REVISED CONTRACT COMPLETION DATE IS:	

OWNER	CONTRACTOR	ENGINEER

_____
Attest

CERTIFICATE OF INSURANCE
(May also use applicable Accord form)

THIS IS TO CERTIFY THAT THE _____
Insurance Company

Address _____

Of _____
has issued policies of insurance, as described below and identified by a policy number, to the insured named below; and to certify that such policies are in full force and effect at this time. It is agreed that none of these policies will be cancelled or changed so as to affect the interest(s) of the York County Government (hereinafter sometimes called the OWNER) until thirty (30) days after written notice of such cancellation or change has been delivered to the ENGINEER.

Insured: _____

Address: _____

Status of Insured
_____ Corporation _____ Partnership _____ Individual

Insured: _____

Description of Work: _____

_____

_____

INSURANCE POLICIES IN FORCE

Forms of Coverage	Policy Number	Expiration Date
*Worker's Comp./Employers' Liability	_____	_____
**Comprehensive Auto Liability	_____	_____
***Excess Liability	_____	_____
Other (Please specify type)	_____	_____

POLICY INCLUDES COVERAGE FOR:		YES	NO
1.	Additional Insured: OWNER and ENGINEER	_____	_____
2.	*Liability under the United States Longshore-men's and Harbor Workers' Compensation Act.	_____	_____
3.	**All owned, hired, or nonowned automotive equipment used in connection with work done for the Owner.		
4.	Contractual Liability	_____	_____
5.	Damage caused by explosion, collapse or structural		

injury, and damage to underground utilities. _____ _____

6. Products/Completed Operations _____ _____

7. Owners and Contractors Protective Liability _____ _____

8. Personal Injury Liability _____ _____

9. ***Excess Liability applies excess of:
   (a) Employers' Liability _____ _____
   (b) Comprehensive General Liability _____ _____
   (c) Comprehensive Automobile Liability _____ _____

Types of Coverage	Forms of Coverage	Minimum Limits of Liability	
Workers' Compensation	Bodily Injury	$ 1,000,000	Statutory
Employers' Liability	Bodily Injury	$ 500,000	Each Accident
	Disease	$ 500,000	Each Person
	Disease	$ 500,000	Policy Limit
Comprehensive Auto Liability	Combined Single Limit BI/PD	$ 1,000,000	Each Accident
Comprehensive General Liability	Bodily Injury	$ 1,000,000	Each Occurrence
		$ 5,000,000	Aggregate

The Insurance Company hereby agrees to deliver, within ten (10) days, two (2) copies of the above policies to the Engineer when so requested.

NOTE: Entries on this certificate are limited to the Authorized Agent or Insurance Company Representative.

Date_____ (SEAL) _____
Insurance Company

Issued at_____
Authorized Representative

Insurance Agent or Company

Send original and one copy to:

York County Engineering
Post Office Box 148
6 South Congress Street
York, South Carolina 29745

END OF SECTION 006216

APPLICATION FOR PAYMENT No. _____

Date: _____ Contractor: _____

Project: _____

Project Number: _____ For Period _____ To _____

Total value of work completed to date (see attached sheet)	$ _____
Total value of materials stored for project (see attached sheet)	$ _____
SUB TOTAL	$ _____
LESS _____ %RETAINED	$ _____
TOTAL	$ _____
LESS PREVIOUS PAYMENTS	$ _____
Other Changes, additions, or deductions (see attached sheet)	$ _____
TOTAL AMOUNT DUE THIS PAYMENT	**$** _____

Previous Payments

1. _____	**4.** _____	**7.** _____	**10.** _____
2. _____	**5.** _____	**8.** _____	**11.** _____
3. _____	**6.** _____	**9.** _____	**12.** _____

Submitted By:

I hereby certify to the best of the Contractor's knowledge, information and belief, the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, and that all amounts have been paid by the Contractor for Work which previous Applications for Payment were issued and payments received from the Owner, that current payment shown herein is now due.

Contractor: _____

Signed By: _____

Date: _____

Notarized: _____
(affix seal)

My Commission Expires: _____

Recommended By:
Architect/Engineer: _____ Date: _____

Certified Amount: $_____

The Certified amount is payable only to the Contractor named herein. Issuance, payment, and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

Accepted By:
Owner: _____ Date: _____

RELEASE AND WAIVER OF CLAIM
BY PRIME CONTRACTOR

Know all men by these presents that the undersigned, _____of _____ _____first being duly sworn, states that all payrolls, materials bills, sales tax, privilege tax or license, old age benefits tax, state and federal unemployment insurance, and other liabilities incurred for use in the performance of the contract for the ***Improvements to Ebenezer Park Phase II*** located in Rock Hill, South Carolina have been paid in full and waives any and all claims and releases York County Government (York County, South Carolina) from any rights or claims for debts due and owing by virtue of the furnishing of any material or supplies or any lien thereon.

_____
(Name of Company)

By: _____

Its: _____

Sworn to before me
this _____day of _____, 20_____ .

_____

Notary Public for _____

My Commission expires: _____

GENERAL CONDITIONS

1. DEFINITIONS

1.1. Whenever used in any of the Contract Documents, the following meanings shall be given to the terms herein defined:

1.1.1. *Addendum* or *Addenda* - Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the Bidding Requirements or the Contract Documents.

1.1.2. *Agreement* - The written contract between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

1.1.3. *Application for Payment* - The form accepted by ENGINEER which is to be used by CONTRACTOR in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

1.1.4. *Bid* - The offer or proposal of the bidder on the prescribed Bid Form setting forth the prices for the Work to be performed.

1.1.5. *Bidder* - One who submits a Bid directly to OWNER, as distinct from sub-bidder, who submits a Bid to a Bidder.

1.1.6. *Bidding Documents* - The Invitation for Bids, Information to Bidders, the Bid Form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

1.1.7. *Bonds* - Performance and Indemnity and Payment Bonds and other instruments of security.

1.1.8. *Change Order* - A document recommended by ENGINEER, which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

1.1.9. *Contract Documents* - Executed Agreement, Addenda (if any), Invitation for Bids, Information to Bidders, Signed Copy of Bid, Bid Guarantee, Statement of Bidder's Qualifications, Performance and Indemnity Bond, Payment Bond, Certification of Insurance, General Conditions, Supplemental Conditions (if any), Special Conditions (if any), Technical Specifications, and Drawings.

1.1.10. *Contract Price* - The moneys payable by OWNER for completion of the Work in accordance with the Contract Documents.

1.1.11. *Contract Times* - The numbers of days or the dates stated in the Agreement: (i) to achieve Substantial Completion, and (ii) to complete the work so that it is ready for final payment as evidenced by ENGINEER's written records.

1.1.12. *CONTRACTOR* - The person, firm, or corporation entering into Contract with the OWNER to construct and install the improvements embraced in this Contract.

1.1.13. *Defective* - An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or had been damaged prior to ENGINEER's recommendation or final payment.

1.1.14. *Drawings* - The construction drawings which graphically show the scope, extent, and character of the Work to be furnished and performed by the CONTRACTOR and which have been prepared or approved by ENGINEER and are referred to in the Contract Documents.

1.1.15. *ENGINEER* – The person, firm or corporation serving the OWNER with Engineering services, his successors, or any other person or persons, employed by said OWNER for the purpose of directing or having charge of the work embraced in this Contract.

1.1.16. *Laws and Regulations; Laws or Regulations* – Any and all applicable laws, rules, regulations, ordinances codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

1.1.17. *Liens* - Liens, charges, security interests or encumbrances upon project funds, real property or personal property.

1.1.18. *Local Government* - York County, South Carolina, within which the Project Areas are situated.

1.1.19. *Milestone* - A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

1.1.20. *Notice of Award* - The written notice by OWNER to the apparent successful Bidder stating that upon compliance by the apparent successful Bidder with the conditions precedent enumerated therein, within the time specified, OWNER will sign and deliver the agreement.

1.1.21. *Notice to Proceed* - A written notice given by OWNER to CONTRACTOR (with a copy to ENGINEER) fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform, CONTRACTOR's obligations under the Contract Documents.

1.1.22. O*WNER* - The York County Government, which is authorized to undertake this Contract.

1.1.23. *Partial Utilization* - Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.1.24. *Project* - The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

1.1.25. *Project Area* - The area within which are the specified limits of the improvements to be constructed in whole or in part under this Contract.

1.1.26. *Project Manual* – The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

1.1.27. *Resident Project Representative* – The authorized representative of ENGINEER who may be assigned to the Site or any part thereof.

1.1.28. *Samples* - Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

1.1.29. *Site* – Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for the use of the CONTRACTOR.

1.1.30. *Shop Drawings* - All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

1.1.31. *Special Conditions* - The part of the Contract Documents that amends or supplements the Technical Specifications.

1.1.32. *Subcontractor* - An individual, firm or corporation having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the site.

1.1.33. *Substantial Completion* - The Work (or specified part thereof) has progressed to the point where, in the opinion of ENGINEER as evidenced by ENGINEER's definitive certification of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by ENGINEER's written recommendation of final payment. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

1.1.34. *Successful Bidder* - The lowest, qualified, responsible and responsive Bidder to whom OWNER (on the basis of OWNER's evaluation as hereinafter provided) makes an award.

1.1.35. *Supplier* – A manufacturer, fabricator, supplier, distributor, material man or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

1.1.36. *Supplemental Conditions* - The part of the Contract Documents that amends or supplements these General Conditions.

1.1.37. *Technical Specifications* - The part of the Contract Documents that describes, outlines, and stipulates: the quality of materials, equipment and systems to be furnished; the quality of workmanship required; and the methods to be used in carrying out the construction work to be performed under this Contract.

1.1.38. *Underground Facilities* - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems, or water.

1.1.39. *Unit Price Work* - Work to be paid for on the basis of unit prices.

1.1.40. *Work* - The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing and incorporating materials and equipment into the construction, and furnishing, installing and incorporating all materials and equipment into such construction, all as required by the Contract Documents..

1.2 Other technical terms not specifically defined within the Contract Documents shall have the meanings given in AIA Document "Glossary of Construction Industry Terms," current edition. Technical terms not defined as above and used to describe items of the Work, and which so applied have a well-known technical or trade meaning, shall be deemed to have such recognized meaning.

2. CONTRACTOR'S OBLIGATIONS

2.1. All work shall be done in strict accordance with the Contract Documents. Observations, construction reviews, tests, recommendations or approvals by the ENGINEER or persons other than the CONTRACTOR, shall in no way relieve the CONTRACTOR of his obligations to complete all work in accordance with the Contract Documents. All work shall be done under the direct supervision of the CONTRACTOR. The CONTRACTOR shall be responsible for construction means, methods, techniques, and procedures, and for providing a safe place for the performance of the work by the CONTRACTOR, Subcontractors, suppliers, and their employees and for access, use, work, or occupancy by all authorized persons.

3. LANDS BY CONTRACTOR

3.1. OWNER shall furnish the Site. OWNER shall notify CONTRACTOR of any encumbrances or restrictions not of general application, but specifically related to the use of the Site with which the CONTRACTOR must comply in performing work.

3.2. Any land and access thereto not specifically shown to be furnished by the OWNER that may be required for temporary construction facilities or for storage of materials and equipment shall be provided by the CONTRACTOR with no liability to the OWNER. The CONTRACTOR shall confine his apparatus and storage to such additional areas as he may provide at his expense.

3.3. The CONTRACTOR shall not enter upon private property for any purpose without obtaining permission, and he shall be responsible for the preservation of all public property, trees, monuments, structures and improvements, along and adjacent to the street and/or right-of-way, and shall use every precaution necessary to prevent damage or injury thereto. He shall use suitable precautions to prevent damage to pipes, conduits, and other underground structures, and shall protect carefully from disturbance or damage all monuments and property marks until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed.

4. SURVEYS BY CONTRACTOR

4.1. Based upon the Construction Documents and any additional information provided by the OWNER, the CONTRACTOR shall develop and make all detailed surveys necessary for construction, including working points, lines and elevations.

5. PUBLIC UTILITIES

5.1. The elevation and location of all public utilities shown on the Drawings were taken from existing public records. It shall be the duty of the CONTRACTOR to make final and exact determination of the location and extent of all utilities and he will be liable for any expense resulting from damage to them.

6. SUPERINTENDENT

6.1. A qualified superintendent, who is acceptable to the OWNER, shall be maintained on the Work and shall give efficient supervision to the Work until its completion. The superintendent shall have full authority to act in behalf of the CONTRACTOR, and all instruction given to the superintendent shall be considered as given to the CONTRACTOR. It shall be the responsibility of this CONTRACTOR's superintendent to coordinate the Work of all the Subcontractors. The superintendent shall be present on the site at all times required to perform adequate supervision and coordination.

7. SUBCONTRACTORS

7.1. At the time set forth in the Contract Documents or when requested by the OWNER, the CONTRACTOR shall submit in writing for review of the OWNER the names of the Subcontractors proposed for the work. Subcontractors may not be changed except at the request or with the approval of the OWNER. The CONTRACTOR is responsible to the OWNER for the acts and deficiencies of his Subcontractors, and of their direct and indirect employees, to the same extent as he is responsible for the acts and deficiencies of his employees. The Contract Documents shall not be construed as creating any contractual relation between any Subcontractor and the OWNER. The CONTRACTOR shall bind every Subcontractor by the terms of the Contract Documents.

8. ASSIGNMENTS

8.1. The CONTRACTOR shall not assign the whole or any part of this Contract or any moneys due or to become due hereunder without written consent of the OWNER. In case the CONTRACTOR assigns all or any part of any moneys due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the CONTRACTOR shall be subject to prior claims of all persons, firms, and corporations for services rendered or materials supplied for the performance of the work called for in this Contract.

9. MUTUAL RESPONSIBILITY OF CONTRACTORS

9.1. If through acts of neglect on the part of the CONTRACTOR, any other CONTRACTOR or any Subcontractor shall suffer loss or damage on the work, the CONTRACTOR agrees to settle with such other CONTRACTOR or Subcontractor by agreement or arbitration if such other CONTRACTOR or Subcontractor will so settle. If such other CONTRACTOR or Subcontractor shall assert any claim against the OWNER on account of any damage alleged to have been sustained, the OWNER shall notify the CONTRACTOR, who shall indemnify and save harmless the OWNER against any such claim.

10. ORAL AGREEMENTS

10.1. No oral order, objection, claim or notice by any party to the others shall affect or modify any of the terms or obligations contained in any of the Contract Documents, and none of the provisions of the Contract Documents shall be held to be waived or modified by reason of any act whatsoever, other than by a definitely agreed waiver or modification thereof in writing, and no evidence shall be introduced in any proceeding of any other waiver or modification.

11. MATERIALS, SERVICE AND FACILITIES

11.1. It is understood that except as otherwise specifically stated in the Contract Documents, the CONTRACTOR shall provide and pay for all materials, labor, tools, equipment, water, gas, light, power, transportation, superintendence, taxes, insurance, temporary construction of every nature, and all other services and facilities of every nature whatsoever necessary to execute, complete, and deliver the work within the specified time.

11.2. Any work necessary to be performed after regular working hours, on Sundays or Legal Holidays, shall be performed without additional expense to the OWNER.

12. MATERIALS AND EQUIPMENT

The materials and equipment installed in the work shall meet the requirements of the Contract Documents and no materials or equipment shall be ordered until reviewed by the ENGINEER. The CONTRACTOR shall furnish all materials and equipment not otherwise specifically indicated or provided by the OWNER. The CONTRACTOR shall guarantee all materials and equipment he provides in accordance with Section 16 of these GENERAL CONDITIONS.

12.1. Substitutions: In order to establish standards of Quality, the ENGINEER has, in the detailed Specifications, referred to certain products by name and catalog number without consideration of possible substitute or “or equal” items. This procedure is not to be construed as eliminating from competition other products of equal or better quality by other manufacturers where fully suitable in design.

12.1.1. Whenever it is indicated in the Drawings or specified in the specifications that a substitute or “or-equal” item of material or equipment may be furnished or used by the CONTRACTOR, application for such acceptance will not be considered by the ENGINEER until after the Effective Date of the agreement. The CONTRACTOR shall furnish the complete list of proposed desired substitutions, together with such engineering and catalog data as the ENGINEER may require. All proposals for substitutions shall be submitted in writing by the General Contractor and not by individual trades or material suppliers. The ENGINEER will review proposed substitutions and make his recommendations in writing within reasonable time.

12.1.2. The CONTRACTOR shall abide by the ENGINEER's recommendation when proposed substitute materials or items of equipment are not recommended for installation and shall furnish the specified material or item of equipment in such case.

12.2. Space Requirements: It shall be the responsibility of the CONTRACTOR to ensure that materials and equipment to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections, and shall order such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the Contract Documents.

12.3. Arrangement: Where equipment requiring different arrangement of connections from those shown is approved, it shall be the responsibility of the CONTRACTOR to install the equipment to operate properly, and in harmony with the intent of the work required by such arrangement.

12.4. Unacceptable Materials and Equipment: Materials and equipment which do not conform to the requirements of the Contract Documents, or are not equal to samples reviewed by the ENGINEER, or are in any way unsatisfactory or unsuited to the purpose for which they are intended, shall not be furnished nor installed.

12.5. Storage: Materials and equipment shall be so stored as to ensure the preservation of their quality and fitness for the work. When considered necessary, they shall be placed on wooden platforms or other hard, clean surfaces, and not on the ground and/or they shall be placed under cover. Stored materials and equipment shall be located so as to facilitate prompt inspection. Private property shall not be used for storage purposes without the written permission of the property owner or leasee.

Materials, equipment, construction machinery, fuel, and oils shall not be stored or parked within the drip-line of any trees in or adjacent to the project site or additional off-site easements and right-of-ways.

12.6. Manufacturer's Directions: Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the manufacturer.

13. INSPECTION AND TESTING OF MATERIALS

13.1. Unless otherwise specifically provided for in the specifications, the inspection and testing of material and finished articles to be incorporated in the work at the site shall be made by bureaus, laboratories, or agencies approved by the OWNER. The cost of such inspection and testing shall be paid by the CONTRACTOR. The CONTRACTOR shall furnish evidence satisfactory to the OWNER that the material and finished articles have passed the required tests prior to the incorporation of such materials and finished articles in the work. The CONTRACTOR shall promptly segregate and remove rejected material and finished articles from the site of the work.

14. SAMPLES

14.1. All samples called for in the Specifications or required by the ENGINEER shall be furnished by the CONTRACTOR and shall be submitted to the ENGINEER for his review. Samples shall be furnished so as not to delay fabrication, allowing the ENGINEER reasonable time for the consideration of the samples submitted.

14.1.1. Samples for Tests: CONTRACTOR shall furnish such samples of material as may be required for examination and test. All samples of materials for tests shall be taken according to standard methods or as provided in the Contract Documents.

14.1.2. CONTRACTOR's Guaranty: All samples shall be submitted by the CONTRACTOR with a covering letter indicating that such samples are recommended by the CONTRACTOR for the service intended and that the CONTRACTOR's Guaranty will fully apply.

14.1.3. All materials, equipment and workmanship shall be in accordance with samples guaranteed by the CONTRACTOR and reviewed by the ENGINEER.

15. SHOP DRAWINGS

15.1. The CONTRACTOR shall provide shop drawings, setting schedules and such other drawings as may be necessary for the prosecution of the work in the shop and in the field as required by the Drawings, Specifications or the ENGINEER's instructions. Deviations from the Drawings and Specifications shall be called to the attention of the ENGINEER at the time of the first submission of shop drawings and other drawings for consideration. The ENGINEER's review of any drawings shall not release the CONTRACTOR from responsibility for such deviations. Shop drawings shall be submitted according to a schedule prepared jointly by the CONTRACTOR and the ENGINEER.

15.1.1. CONTRACTOR's Certification: When submitted for the ENGINEER's review, shop drawings shall bear the CONTRACTOR's certification that he has reviewed, checked and approved the shop drawings, that they are in harmony with the requirements of the Project and with the provisions of the Contract Documents, and that he has verified all field measurements and construction criteria, materials, catalog numbers and similar data. CONTRACTOR shall also certify that the work represented by the shop drawings is recommended by the CONTRACTOR and the CONTRACTOR's Guaranty will fully apply.

16. GUARANTY

16.1. The CONTRACTOR shall guarantee all materials and equipment furnished and work performed for a period of two years from the date of final payment of the work.

16.1.1. The Performance and Indemnity Bond shall remain in full force and effect during the guaranty period.

16.1.2. Correction of faulty work after final payment shall be as provided in Paragraph 41.

17. INSURANCE

17.1. The CONTRACTOR shall not commence any work until he obtains, at his own expense, all required insurance. Such insurance must have the approval of the OWNER as to the limit, form, and amount. The CONTRACTOR will not permit any Subcontractor to commence work on this project until such Subcontractor has complied with the same insurance requirements.

Types: The types of insurance the CONTRACTOR is required to obtain
and maintain for the full period of the Contract will be: Workmen's Compensation Insurance, Automobile and Comprehensive General Liability Insurance as detailed in the following portions of this specification.

17.1.2. Evidence: As evidence of specified insurance coverage, the OWNER may, in lieu of actual policies, accept certificates issued by the insurance carrier showing such policies in force for the specified period. Each policy or certificate will bear an endorsement or statement waiving right of cancellation or reduction in coverage within ten days' notice in writing to be delivered by registered mail to the OWNER. Should any policy be cancelled before final payment by the OWNER to the CONTRACTOR and the CONTRACTOR fails immediately to procure other insurance as specified, the OWNER reserves the right to procure such insurance and to deduct the cost thereof from any sum due the CONTRACTOR under this Contract.

17.1.3. Adequacy of Performance: Any insurance bearing on adequacy of performance shall be maintained after completion of the project for the full guaranty period. Should such insurance be cancelled before the end of the guaranty period and the CONTRACTOR fails immediately to procure other insurance as specified, the OWNER reserves the right to procure such insurance and to charge the cost thereof to the CONTRACTOR.

17.1.4. Payment of Damages: Nothing contained in these insurance requirements is to be construed as limiting the extent of the CONTRACTOR's responsibility for payment of damages resulting from his operations under this Contract.

18. WORKMEN'S COMPENSATION INSURANCE

18.1. Before the Agreement between the OWNER and the CONTRACTOR is entered into, the CONTRACTOR shall submit written evidence that he and all Subcontractors have obtained, for the period of the Contract, full Workman's Compensation Insurance coverage for all persons whom they employ or may employ in carrying out the work under this Contract. This insurance shall be in strict accordance with the requirements and statutory limits of the most current and applicable South Carolina Workman's Compensation Insurance Laws.

19. COMPREHENSIVE GENERAL LIABILITY AND AUTOMOBILE INSURANCE

19.1. Before commencement of the work, the CONTRACTOR shall submit written evidence that he and all his Subcontractors have obtained for the period of the Contract, full Comprehensive General Liability Insurance and automobile coverage. This coverage shall provide for both bodily injury and property damage.

19.1.1. Comprehensive General Liability Insurance shall include coverage for bodily injury, sickness or disease, death, or property damage arising directly or indirectly out of or in connection with the performance of work under this Contract, and shall provide for a combined single limit of not less than one million ($1,000,000) dollars for all damages arising out of bodily injury, sickness or disease, death, or property damage for each occurrence.

19.1.2. Automobile insurance shall include coverage for bodily injury and property damage arising directly or indirectly out of or in connection with the performance of work under this Contract, and shall provide for a combined single limit of not less than one million ($1,000,000) dollars for all damages arising out of bodily injury or property damage for each occurrence.

19.1.3. Indemnity: Included in such insurance will be contractual coverage sufficiently broad to insure the provisions of Paragraph 20.

20. INDEMNITY

20.1. The CONTRACTOR shall hold harmless, indemnify and defend the OWNER, it’s successors and assigns, the ENGINEER, their consultants, and each of their officers and employees and agents, from any and all liability claims, losses or

damage arising or alleged to arise from the performance of the work described herein, but not including the sole negligence of the OWNER or the ENGINEER.

21. PATENTS AND ROYALTIES

21.1. If any design, device, material or process covered by letters, patent or copyright is used by the CONTRACTOR, he shall provide for such use by legal agreement with the OWNER of the patent or a duly authorized licensee of such OWNER, and shall save harmless the OWNER, and the ENGINEER, from any and all loss or expense on account thereof, including its use by the OWNER.

22. PERMITS

22.1. All permits and licenses necessary for the prosecution of the work shall be secured and paid for by the CONTRACTOR. This shall include all Business Licenses required by the Local Government.

23. LAWS TO BE OBSERVED

23.1. The CONTRACTOR shall give all notices and comply with all Federal, State and local laws, ordinances and regulations in any manner affecting the conduct of the work, and all such orders and decrees as exist, or may be enacted by bodies or tribunals having any jurisdiction or authority over the work, and shall indemnify and save harmless the OWNER its successors and assigns, the ENGINEER, their consultants, and each of their officers and employees and agents against any claim or liability arising from, or based on, the violation of any such law, ordinance, regulation, order or decree, whether by himself or his employees.

24. WARNING SIGNS AND BARRICADES

24.1. The CONTRACTOR shall provide adequate signs, barricades, and watchmen and take all necessary precautions for the protection of the work and the safety of the public.

25. PUBLIC CONVENIENCE

25.1. The CONTRACTOR shall at all times so conduct his work as to ensure the least possible obstruction to traffic and inconvenience to the general public and the residents in the vicinity of the work, and to ensure the protection of persons and property. No road or street shall be closed to the public except with permission of the proper authorities. Fire hydrants on or adjacent to the work shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the CONTRACTOR to ensure the use of sidewalks and the proper functioning of all gutters, sewer inlets, drainage ditches, and irrigation ditches, which shall not be obstructed.

26. SAFETY

26.1. The CONTRACTOR shall be solely and completely responsible for the conditions of the job site, including safety of all persons and property affected directly or indirectly by his operation during the performance of the work. This requirement will not be limited to normal working hours but will apply continuously 24 hours per day until written acceptance of the work by the OWNER and shall not be limited to normal working hours.

26.2. The ENGINEER's construction reviews of the CONTRACTOR’s performance is not intended to include review of the adequacy of the CONTRACTOR's safety measures in, on, or near the construction site.

27. NOTICE TO PROCEED

27.1. Following the execution of the Contract by the OWNER and the CONTRACTOR, written Notice to Proceed with the work shall be given by the OWNER to the CONTRACTOR. The CONTRACTOR shall begin and shall prosecute the work regularly

and uninterruptedly thereafter (except as provided for herein) with such force as to secure the completion of the work within the Contract Time.

28. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

28.1. It is hereby understood and mutually agreed, by and between the CONTRACTOR and the OWNER, that the date of beginning and the time for completion as specified in the Contract of the work to be done hereunder are ESSENTIAL CONDITIONS of this Contract; and it is further mutually understood and agreed that the work embraced in this Contract shall be commenced on a date to be specified in the Notice to Proceed.

28.2. The CONTRACTOR agrees that said work shall proceed regularly, diligently, and uninterruptedly at such rate of progress as will ensure full completion thereof within the time specified. It is expressly understood and agreed, by and between the CONTRACTOR and the OWNER, that the time for the completion of the work described herein is a reasonable time for the completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

28.3. If said CONTRACTOR shall neglect, fail, or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the OWNER, then the CONTRACTOR does hereby agree, as a part consideration for the awarding of this Contract, to pay to the OWNER the amount specified in the Contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the CONTRACTOR shall be in default after the time stipulated in the Contract for completing the work.

28.4. The said amount is fixed and agreed upon by and between the CONTRACTOR and the OWNER because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the OWNER would in such event sustain, and said amount is agreed to be the amount of damages which the OWNER would sustain and said amount shall be retained from time to time by the OWNER from current periodical estimates.

28.5. It is further agreed that time is of the essence of each and every portion of this Contract and of the Specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this Contract. PROVIDED, that the CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due to the following:

28.5.1. Any preference, priority or allocation order duly issued by the Federal or State Government.

28.5.2. Unforeseeable cause beyond the control and without the fault or negligence of the CONTRACTOR, including, but not restricted to, acts of God, or of the public enemy, acts of the OWNER, acts of another CONTRACTOR in the performance of a contract with the OWNER, fires, flood, epidemics, quarantine restrictions, strikes, freight embargoes and unusually severe weather; and

28.5.3. Any delays of Subcontractors or suppliers occasioned by any of the causes specified in subsection 28.5.1. and 28.5.2. of this article:

> PROVIDED, FURTHER, that the CONTRACTOR shall, within 10 days from the beginning of such delay, unless the OWNER shall grant a further period of time prior to the date of final settlement of the contract, notify the OWNER, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the CONTRACTOR within a reasonable time of its decision in the matter, and grant such extension of time as the OWNER shall deem equitable and just.

29. CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES

29.1. Immediately after execution and delivery of the contract, and before the first partial payment is made, the CONTRACTOR shall deliver to the OWNER an estimated construction progress schedule in a form satisfactory to the OWNER, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents.

30. EXTENSION OF CONTRACT TIME

30.1. A delay beyond the CONTRACTOR's control occasioned by an Act of God, by act or omission on the part of the OWNER or by strikes, lockouts, fire, etc., may entitle the CONTRACTOR to any extension of time in which to complete the work as agreed by the OWNER, provided, however, that the CONTRACTOR shall immediately give written notice to the OWNER of the cause of such delay.

30.2. Act of God shall mean an earthquake, flood, cyclone, or other cataclysmic phenomenon. Storms of normal intensity for the locality shall not be construed as an Act of God and no reparation shall be made to the CONTRACTOR for damages to the work resulting there from.

31. EXTRA WORK

31.1. New and unforeseen items of work found to be necessary, and which cannot be covered by any item or combination of items for which there is a Contract price, shall be classed as Extra Work. It shall be the responsibility of the CONTRACTOR to identify necessary work items classed as Extra Work and for which no previous contract price has been arranged and advise the ENGINEER and the OWNER of the need for the aforesaid necessary Extra Work. The CONTRACTOR shall do such Extra Work and furnish such materials as may be required for the proper completion or construction of the whole work contemplated, upon written order from the OWNER as approved by the ENGINEER. In the absence of such written order, no claim for Extra Work shall be considered.

31.2. Extra Work shall be performed in accordance with these Contract Documents where applicable and work not covered by such shall be done in accordance with the best construction practice and in a workmanlike manner.

31.3. Extra Work required in an emergency to protect life and property shall be performed by the CONTRACTOR as required.

32. CLEANING UP

32.1. The CONTRACTOR shall at all times, keep the premises clean and shall remove from the OWNER's property, and from all public and private property, temporary structures, rubbish, waste materials resulting from his operation or caused by his employees, and all surplus materials, leaving the site smooth, clean and true to line and grade and in the same condition as existed prior to the work performed by the CONTRACTOR or his Subcontractors and as approved by the OWNER. Failure to maintain a clean project site or to complete clean-up of the project site at the completion of the work shall be cause for the OWNER to perform the necessary clean-up and the costs thereof shall be charged to the CONTRACTOR.

33. REQUEST FOR PAYMENT

33.1. The CONTRACTOR may submit to the OWNER periodically, but not more than once each month, a Request for Payment for work done and materials delivered to and stored on the site. The CONTRACTOR shall furnish the OWNER all reasonable information required for obtaining the necessary data relative to the progress and execution of the work. Payment for materials stored on the site will be conditioned upon evidence submitted to establish the OWNER's title to such materials. Each Request for Payment shall be computed on the basis of work completed on all items listed in the Detailed Breakdown of Contract (or on unit prices, as the case may be), less 10 percent to be retained until final completion and acceptance of the work and less previous payments.

34. ENGINEER'S ACTION ON REQUEST FOR PAYMENT

34.1. All CONTRACTOR's Requests for Payment shall be referred to the ENGINEER for his review and, within a reasonable period, the ENGINEER shall:

34.1.1. Recommend payment by the OWNER of the Request for Payment as submitted.

34.1.2. Recommend payment by the OWNER of such other amount as the ENGINEER shall consider as due the CONTRACTOR, informing the OWNER and the CONTRACTOR in writing of his reasons for recommending the amended amount.

34.1.3. Recommend to the OWNER that payment of the Request for Payment be withheld, informing the CONTRACTOR and the OWNER in writing of his reasons, for so recommending.

35. OWNER'S ACTION ON REQUEST FOR PAYMENT

35.1. Within thirty days after receipt of a Request for Payment from the CONTRACTOR, the OWNER shall:

35.1.1. Pay the Request for Payment as recommended by the ENGINEER.

35.1.2. Pay such other amount, in accordance with Paragraph 36, as he shall decide is due the CONTRACTOR, informing the CONTRACTOR and the ENGINEER in writing of this reasons for paying the amended amount.

35.1.3. Withhold payment in accordance with Paragraph 36, informing the CONTRACTOR and the ENGINEER of his reasons for withholding payment.

36. OWNER'S RIGHT TO WITHHOLD PAYMENT OF A REQUEST FOR PAYMENT

36.1. The OWNER may withhold payment, in whole or in part, of a Request for Payment to the extent necessary to protect himself from loss on account of any of the following:

36.1.1. Defective work.

36.1.2. Evidence indicating the probable filing of claims by other parties against the CONTRACTOR that may adversely affect the OWNER.

36.1.3. Failure of the CONTRACTOR to make payments due to Subcontractors, material suppliers, or employees.

36.1.4. Damage to another CONTRACTOR.

37. PAYMENT FOR EXTRA WORK

37.1. Written notice of claims for payment for Extra Work shall be given by the CONTRACTOR within ten days after receipt of instructions from the OWNER to proceed with the Extra Work and also before any work is commenced, except in emergency endangering life or property. No claim shall be valid unless so made. In all cases, the CONTRACTOR's itemized estimate sheets showing all labor and material shall be submitted to the OWNER. The OWNER's order for Extra Work shall specify any extension of the Contract Time and one of the following methods of payment:

37.1.1. Unit prices or combination of unit prices which formed the basis of the original Contract.

37.1.2. A lump sum based on the CONTRACTOR's estimate and accepted by the OWNER.

37.1.3. Actual cost plus 15 percent for overhead and profit. Actual costs are defined as follows:

37.1.3.1. Labor costs, including time of foreman while engaged directly upon extra work.

37.1.3.2. Labor insurance and taxes.

37.1.3.3. Materials and supplies actually used on the work.

37.1.3.4. Associated General Contractors of America standard rental rates on each piece of equipment having a value in excess of $50.00. Equipment and tools of lesser value are considered "small tools" and, as such, are considered to be part of overhead.

38. ACCEPTANCE AND FINAL PAYMENT

38.1. When the CONTRACTOR has completed the work in accordance with the terms of the Contract Documents, he shall certify completion of the work to the OWNER and submit a final Request for Payment, which shall be the Contract Amount plus all approved additions, less all approved deductions and less previous payments made. The CONTRACTOR shall furnish evidence that he has fully paid all debts for labor, materials, and equipment incurred in connection with the work, and upon acceptance by the OWNER, the OWNER will release the CONTRACTOR except as to the conditions of the Performance and Indemnity Bond and the Labor and Material Payment Bond, any legal rights of the OWNER, required guaranties, and Correction of Faulty Work after Final Payment, and will pay the CONTRACTOR's final Request of Payment. The CONTRACTOR shall allow sufficient time between the time of completion of the work and approval of the final Request for Payment for the ENGINEER to assemble and check the necessary data.

38.1.1. Release of Liens: The CONTRACTOR shall deliver to the OWNER a complete release of all liens arising out of this Contract before the retained percentage or before the final Request for Payment is paid. If any liens remains unsatisfied after all payments are made, the CONTRACTOR shall refund to the OWNER such amounts as the OWNER may have been compelled to pay in discharging such liens including all costs and a reasonable attorney's fees.

39. OWNER'S RIGHT TO TERMINATE AGREEMENT

39.1. The OWNER shall have the right to terminate his agreement with the CONTRACTOR after giving ten days' written notice of termination to the CONTRACTOR in the event of any default by the CONTRACTOR.

39.1.1 Default by CONTRACTOR: It shall be considered a default by the CONTRACTOR whenever he shall:

39.1.1.1. Declare bankruptcy, become insolvent, or assign his assets for the benefit of his creditors.

39.1.1.2. Disregard or violate provisions of the Contract Documents or fail to prosecute the work according to the agreed Schedule of Completion, including extensions thereof.

39.1.1.3. Fail to provide a qualified superintendent, competent workmen or Subcontractors, or proper materials, or fail to make prompt payment thereof.

39.1.2. Completion by the OWNER: In the event of termination of the Agreement by the OWNER because of default by the CONTRACTOR, the OWNER may take possession of the work and of all materials and equipment thereon and may finish the work by whatever method and means he may select.

40. TERMINATION OF CONTRACTOR'S RESPONSIBILITY

40.1. The Contract will be considered complete when all work has been finished and the project accepted in writing by the OWNER. The CONTRACTOR's responsibility shall then cease, except as set forth in his Performance and Indemnity Bond, as provided in Paragraph 16, Guaranty, and as provided in Paragraph 41, Correction of Faulty Work After Final Payment.

41 CORRECTION OF FAULTY WORK AFTER FINAL PAYMENT

41.1. The making of the final payment by the OWNER to the CONTRACTOR shall not relieve the CONTRACTOR of responsibility for faulty materials or workmanship. The CONTRACTOR shall promptly replace any such defects, as determined by the ENGINEER, discovered within two years from the date of final payment of the work.

42. INSPECTION

42.1. The authorized representatives of the ENGINEER and OWNER shall be permitted to inspect all materials, workmanship, and other relevant project records and data. Materials and workmanship will be subject to the approval of the OWNER and/or his representative.

43. CORRECTION OF WORK

43.1. All work, all materials, whether incorporated in the work or not, all processes of manufacture, and all methods of construction shall be, at all times and places, subject to the inspection of the ENGINEER who shall be the final judge of the quality and suitability of the work, materials, process of manufacturer, and methods of construction for the purposes for which they are used. Should they fail to meet his approval, they shall be forthwith reconstructed, made good, replaced and/or corrected, as the case may be, by the CONTRACTOR at his own expense. Rejected material shall immediately be removed from the site. If, in the opinion of the ENGINEER, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the work injured or not performed in accordance with the Contract hereunder shall be reduced by such amount as in the judgment of the ENGINEER shall be equitable.

44. SUBSURFACE CONDITIONS FOUND DIFFERENT

44.1. Should the CONTRACTOR encounter subsurface and/or latent conditions at the site materially differing from those shown on the Plans or indicated in the Specifications, he shall immediately give notice to the ENGINEER of such conditions before they are disturbed. The ENGINEER will thereupon promptly investigate the conditions, and if he finds and so determines that they materially differ from those shown on the Plans or indicated in the Specifications, he will at once make such changes in the Plans and/or Specifications, as he may find necessary. Any increase or decrease of cost resulting from such changes are to be adjusted in the manner provided in Paragraph 37 of the General Conditions.

45. CONTRACT SECURITY

45.1. The CONTRACTOR shall furnish a Performance Indemnity Bond and Payment Bond (forms attached) in an amount at least equal to 100% of the contract prices as security for the faithful performance of this Contract, as the security for the payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this Contract. The Performance and Indemnity Bond and the Payment Bond may be in one or in separate instruments in accordance with local law. Before final acceptance, each bond must be approved by the OWNER.

46. DISPUTE RESOLUTION

46.1 OWNER and CONTRACTOR agree to negotiate all disputes between them in good faith prior to exercising their rights under law.

46.2 Any claim, dispute or other matter in question arising from or related to this Agreement or the performance or breach thereof, which cannot be resolved through direct discussions between parties shall be subject to mediation as a condition precedent to the institution of legal or equitable proceedings by either party, and only after both parties have completed the mediation process.

46.3 Through mediation, CONTRACTOR and OWNER shall endeavor to resolve claims, disputes, or other matters in question between them by mediation in an informal process in which a third-party mediator facilitates discussion between the parties. The parties may designate a mediator mutually agreeable to both CONTRACTOR and OWNER to conduct the mediation. If the parties are unable to agree upon a mediator, mediation shall be conducted in accordance with the mediation provision of the South Carolina Circuit Court Alternative Dispute Resolution Rules. The mediation shall be conducted in York County, South Carolina. A request for mediation shall be filed in writing with the other party to this Agreement, and legal or equitable proceedings shall be stayed pending mediation for a period of sixty (60) days from the date of the request for mediation is filed, unless stayed for a longer period of time by agreement of the parties or court order. The cost of a third-party mediator will be shared equally by the parties.

46.4 If the parties reach an agreement during the mediation process, they shall reduce the agreement to writing and sign it with their attorneys, if any. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

46.5 In any action or proceedings to enforce or interpret any provision of this Agreement, or where any provision herein is validity asserted as a defense, each Party shall bear its own attorney fees, costs, and expenses.

END OF SECTION 007200

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. Access to site.
4. Work restrictions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Ebenezer Park

1. Project Location: Ebenezer Park, 4490 Boatshore Road, Rock Hill, SC 29745

B. Owner: York County, Attn: Ron Pompey, York County Engineering Department

C. Project Manager: ADC Engineering, Inc., Attn: Fred Guthier, 864-751-9125

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. The work of this project consists of furnishing all labor, materials, equipment, tools, transportation, services, and incidentals; and of performing all work necessary to complete all specified work in accordance with the Contract Documents prepared therefore and entitled Improvements to Ebenezer Park (YCE 17256). The work generally consists of the construction of the replacement of 2 restroom/shower buildings, 13 new campsites, campsite improvements, campsite driveway paving, road widening, new parking, existing parking improvements, and utility work..

1.5 WORK BY OWNER

A. General: 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. Concurrent Work: Owner may perform certain construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1.6 WORK UNDER SEPARATE CONTRACTS

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

B. Concurrent Work: Owner may award a separate contract(s) or use Owner's personnel for performance of certain construction operations at the site for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1.7 ACCESS TO SITE

A. General: 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. 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.

1.8 WORK RESTRICTIONS

A. Work Restrictions:

1. Contractor shall coordinate with Owner for acceptable onsite working hours and restrictions.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

C. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, 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.

1.9 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. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. 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.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
2. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.
3. Instructions to Bidders: For approval of materials, equipment, and product substitution requests prior to Bid Opening.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit copies of each request for consideration directly to the Project Web Site. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: See 01 25 50 A - Proposed Substitution Request form.

a. Substitutions during the bid period shall be submitted to the Architect through a General Contractor bidding the work.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication, or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design

characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within seven days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than seven days prior to time required for preparation and review of related submittals.

1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.

c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution is compatible with other portions of the Work.
e. Requested substitution has been coordinated with other portions of the Work.
f. Requested substitution provides specified warranty.
g. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
h. Requested substitution does not require extensive revisions to the Contract Documents.
i. Requested Substitution meets the conditions of "Substitutions for Cause" above.

PART 3 - EXECUTION

3.1 Proposed Substitution Request Form: for Contractor's use follows this Section.

A. Substitution Requests during the bid period must be submitted to the Architect through a bidding General Contractor .

END OF SECTION 01 25 00

PROPOSED SUBSTITUTION REQUEST FORM
Form must be signed by a General Contractor bidding the work.

To:_____
General Contractor's name

We hereby submit for your consideration the following product in lieu of the specified item for the above project:

DRAWING NO.	SPECIFICATION SECTION	PARAGRAPH	ITEM SPECIFIED
_____	_____	_____	_____

Proposed Substitution:_____

Manufacturer:_____

Attach complete information on proposed changes and/or to Drawings and/or Specifications which the proposed substitution will require for its proper installation.

Provide the length of time the manufacturer has been in business in the manufacturer of this product.

Submit with request all necessary samples, manufacturer's substantiating data, performance and test reports to prove equal quality and performance to the product that is specified. Clearly mark manufacturer's literature to indicate equality in performance to assist in the evaluation of the substitution by the Architect. Provide a written description of the proposed substitution and provide as an attachment to this request form.

The following supporting data is attached to this substitution:

_Drawings	_Performance & Test Reports	_Written Description
_Product Samples	_Samples	_Other

Complete the following:

1. Does the proposed substitution affect dimensions and or details shown on the Drawings? Yes No
   If yes, clearly indicate the changes below or on an attached sheet.

   _____

2. Will the undersigned pay for any and all changes to the building design, including engineering and detailing costs caused by the requested substitution? Yes No If no, fully explain:

   _____

3. Does the proposed substitution have any affect on other Contracts or other Trades? Yes No
   If yes, fully explain:_____

   _____

4. Does the proposed substitution affect the construction schedule? Yes No
   If yes, fully explain:_____

   _____

5. The differences between the warranties of the proposed substitution and specified items are:

   Same _____ Different _____ (Explain on attachment.)

6. State the reason for the proposed substitution request:_____

7. Itemize the comparison of specified item(s) with the proposed substitution; list all variations:_____

_____

8. Provide cost comparison between the proposed substitution and the product specified._____

_____

9. Provide a detail explanation as to why this substitution is a benefit to the Owner._____

_____

10. Will service and maintenance parts be readily available after installation is complete?_____

_____

11. If it is determined that this proposed substitution does not comply with the contract documents after approval, will the undersigned agree to pay for the removal and reinstallation of one of the specified products.
_Yes _No If no, explain : _____

12. Years the manufacturer been in business producing this product? _____

The undersigned certifies that the proposed substitution has been fully investigated and the function, appearance and quality are equivalent or superior to the specified item. **Form must be signed by a General Contractor bidding the work.**

Submitted By:

_____
Name of GC representative (Signature)

_____
Name (Printed)

_____
Title

_____
Firm

_____
Address

_____
Telephone *Date*

_____
Email Address:

The person signing this substitution request form shall have authority to legally bind his firm to the terms listed above. The failure to provide a legally binding signature will result in the Architect's rejection of this proposed substitution.

Architect's Response:

If the proposed substitution is approved by the Architect during the bidding phase the proposed product will be listed in an addendum stating the product is approved.

Approval of the substitution in an addendum does not relieve the Contractor's of his responsibility for meeting the requirements of the contract documents and the information provided and certified on this Proposed Substitution Request Form.

Should this form be used to make a substitution request after the bidding phase, the approval of a substitution will be documented by Change Order.

CRAIG GAULDEN DAVIS 864.242.0761
www.cgdarch.com

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 this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.3 MINOR CHANGES IN THE WORK

A. Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the 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 forms acceptable to Engineer.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Engineer.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. 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.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.

5. 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.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Engineer.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Engineer will issue a Change Order for signatures of Owner and Contractor.

1.6 CHANGE DIRECTIVE

A. Change Directive: Engineer may issue a Change Directive. A Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012638 – WEATHER DELAYS

PART 1 GENERAL

1.01 EXTENSIONS OF CONTRACT TIME:

A. If the basis exists for an extension of time, in accordance with the General Conditions and Provisions, an extension of time on the basis of weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard Baseline for the entire construction duration of each phase as a whole.

1.02 STANDARD BASELINE FOR AVERAGE CLIMATIC RANGE:

A. Weather data available from the National Oceanic and Atmospheric Administration (NOAA) has been reviewed and a Standard Baseline of average climatic range has been determined.

B. Standard Baseline shall be regarded as the normal and anticipatory number of calendar days for each month during which construction activity shall be expected to be prevented and suspended by cause of precipitation in excess of one-tenth inch (0.10") liquid measure. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.

C. Standard Baseline (based upon precipitation in excess of one-tenth inch (0.10") liquid measure) established for this contract is as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6	5	5	5	5	8	9	9	7	5	4	6

1.03 ADVERSE WEATHER AND WEATHER DELAY DAYS:

A. Adverse Weather is defined as the occurrence of one or more of the conditions below which prevents exterior construction activity or access to the site within twenty-four (24) hours including a weekend day or holiday provided that the Contractor has scheduled construction activities that day. Scheduled construction activities are defined as those activities that are detailed and planned in the Contractor's weekly construction progress meetings. No consideration for an adverse weather day will be granted for which no construction activities are scheduled.

1. precipitation (rain, snow, or ice) in excess of one-tenth inch (0.10") liquid measure;
2. temperatures which do not rise above 32 degrees F by 10:00 a.m.;
3. temperatures which do not rise above that specified for the day's construction activity by 10:00 a.m., if any is specified;
4. sustained wind in excess of twenty-five (25) m.p.h.;
5. standing snow in excess of one inch (1.00");
6. any day that the Owner has requested no work to be performed.

B. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the Contractor's scheduled workday, including a weekend day or holiday provided that the Contractor has scheduled construction activity that day. No consideration for a weather delay day will be granted for which no construction activities are scheduled.

Adverse Weather may include "dry-out" or "mud" days, as determined by the Engineer such as:

1. For rain days above the standard baseline.
2. Only if there is a hindrance to site access or sitework, such as excavation, embankment, backfill, footings, etc. (see 4. & 5. below).
3. At a rate no greater than one (1) make-up day for each day or consecutive days of rain beyond the standard baseline that total 0.1 inch or more, liquid measure, if no substantial work is possible (see 4. & 5. below), unless specifically recommended otherwise by the Engineer.

4. If the Contractor's activity is limited to approximately 50% of the Contractor's activity before the Adverse Weather occurrence, then one half (1/2) a weather delay day will be counted. For example, if the Contractor is disking excavation and embankment areas to dry in situ moisture in the soils or hauling and placing unclassified excavation or borrow material to the embankment before an Adverse Weather occurrence but is able to continue disking excavation and embankment areas or placing unclassified excavation or borrow material, one half (1/2) a Weather Delay Day will be allowed.

5. If the Contractor's activity is limited to only minor activity when compared to the Contractor's activity before the Adverse Weather occurrence, then one (1) weather delay day will be counted. For example, if the Contractor is disking excavation and embankment areas to dry in situ soils, hauling borrow material to embankment before an Adverse Weather occurrence but is only able to disk excavation and embankment areas to dry them due to the Adverse Weather occurrence, one (1) Weather Delay Day will be allowed.

C. If the Contractor is able to only perform disking operations to dry excavation and embankment areas due to in situ moisture conditions in the soil, this is not considered an Adverse Weather occurrence or a Weather Delay Day and is considered to be a part of normal construction activities whether any other work can be performed or not.

D. The Engineer will compile monthly weather data from the Local National Weather Station located at Airport's Air Traffic Control Tower.

The determination of Contractor's entitlement for any Adverse Weather and Weather Delay days, as defined hereinabove, will be based on the entire construction duration of the phase in lieu of a month-by-month consideration. The entitlements will consider those months that conditions are better or worse than the Standard Baseline established for this contract.

For example:

1. Assume that the total number of standard baseline days for a hypothetical Phase is forty-one (41) days and there are thirty-six (36) days with precipitation in excess of one tenth inch (0.10") liquid measure and ten (10) weather delay days. Four (4) of the thirty-six (36) days with precipitation in excess of one tenth inch (0.10") occurred on Sundays and the Contractor did not plan to work on the Sundays. The summation of the number of adverse weather plus weather delay days granted would be forty-two (42). This is determined by taking the 36 adverse weather days and subtracting the 4 adverse weather days that occurred on Sundays when the contractor planned no work and then adding the 10 weather delay days (on which the contractor had planned work activities) which sums to a total of forty-two (42) adverse weather plus weather delay days. This would amount to one (1) day in excess of the total baseline days for that hypothetical Phase. One (1) additional day will be added to the time for that Phase.
2. If the total standard baseline for a Phase is forty-one (41) days and there are twenty (28) days with precipitation in excess of one tenth inch (0.10") liquid measure and nine (9) weather delay days, giving a total of thirty-seven (37) rain and weather delay days. This would amount to four (4) days better than the total baseline days for that Phase. Four (4) days will be deducted from the time for that Phase.

Baseline days will be prorated when partial months are a part of a phase/stage or the overall contract time.

For example:

1. If the contract or a phase begins on April 11, including April 11, there are twenty (20) calendar days remaining in April. Twenty (20) remaining calendar days divided by thirty (30) total calendar days in April equals 0.6667. Six (6) total baseline days established for April multiplied times 0.6667 equals four (4) baseline days for the remaining twenty calendar days in April.

Section 012638, Weather Delays establishes an anticipated number of days of lost construction time for each month.

1. To calculate any liquidated damages the number of baseline days will be calculated from the standard baseline.
2. The number of weather delay days for the actual total construction time will be calculated.
3. The difference in weather delay days and baseline days will then be calculated. Months that have less

weather delay days than baseline days will not result in a negative number.

4. The resulting difference will then be added to the contract time.

5. The difference in the actual total construction time and the contract time plus weather delay days in excess of the baseline for that phase/stage will determine if and what the actual amount of liquidated damages for that phase/stage will be.

The following is an example of calculating weather delay time. This example assumes that all adverse weather + weather delay days occurred on days that the contractor had planned work activities. Using a hypothetical project with a total number of 60 consecutive calendar days of contract time and a Notice-to-Proceed date of July 10, 2003 and a hypothetical number of actual weather delay days as follows:

FROM	TO	HISTORICAL BASELINE DAYS	ADVERSE WEATHER +WEATHER DELAY DAYS	NUMBER OF DAYS IN EXCESS OF BASELINE
July 10, 2004	July 31, 2004	5	3	0
Aug. 1, 2004	Aug. 31, 2004	7	11	+4
Sept. 1, 2004	Sept. 8, 2004	1	4	+3
		13	18	+7
Contract Time				60
Contract Time + Number Of Weather Delay Days In Excess Of Baseline				67
Actual Construction Time				69
``Days Of Liquidated Damages				2

Throughout the duration of the contract, the Contractor and the Resident Project Representative shall reconcile impacts due to weather on a monthly basis. The Contractor shall submit monthly with each pay request an itemized list of days impacted by the weather, scheduled activity that was impacted and the particular impact which caused the delay (temperature, rain, mud, snow, etc.).

END OF SECTION

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. Requests for Information (RFIs).
3. Project Web site.
4. Project meetings.

B. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Engineer 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:

B. Key Personnel Names: Within 7 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including 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.

1.5 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. 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. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.6 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. All submittals shall be made digitally through Bluebeam Studio.

1. Engineer will return RFIs submitted to Engineer by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Engineer
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Engineer.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven working days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for approval of Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Engineer's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt of additional information.
3. Engineer'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 Section 012600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within 7 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Engineer.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Engineer's response was received.

F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven days if Contractor disagrees with response.

1.7 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 Engineer of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer within two days of the meeting.

B. SWPPP Pre-construction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner, Engineer, and MS4, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner**,** Engineer, MS4 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.
3. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Critical work sequencing and long-lead items.
    c. Designation of key personnel and their duties.
    d. Lines of communications.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFIs.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.
    k. Preparation of record documents.
    l. Use of the premises.
    m. Work restrictions.
    n. Working hours.
    o. Responsibility for temporary facilities and controls.
    p. Parking availability.
    q. Equipment deliveries and priorities.
    r. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes through email and hard copies sent through the mail.

C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires 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 Engineer and Owner of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration.
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. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Engineer, but no later than 45 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of record documents.

b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for preparing operations and maintenance data.
e. Requirements for demonstration and training.
f. Preparation of Contractor's punch list.
g. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
h. Submittal procedures.
i. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at weekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of 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.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

4. Minutes: Contractor shall be responsible for conducting the meeting to 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.

F. Coordination Meetings: Conduct Project coordination meetings at same time as progress meetings.

1. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined 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.
    b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each contractor present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from 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. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction reports.
4. Material location reports.
5. Site condition reports.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
2. Section 014000 "Quality Requirements" for submitting a schedule 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.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.

2. Available through email.

B. Startup construction schedule.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Construction Reports: Submit at weekly intervals.

F. Material Location Reports: Submit at weekly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

1.5 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, 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.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. 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.

B. 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 20 days, unless specifically allowed by Engineer.
2. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
3. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.
5. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. 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.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Recovery Schedule: When periodic update indicates the Work is 14 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.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule via Email within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 14 days of date established for commencement of the Work. 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.

2.4 REPORTS

A. Construction Reports: Prepare a construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. Equipment at Project site.
3. Material deliveries.
4. High and low temperatures and general weather conditions, including presence of rain or snow.
5. Accidents.
6. Meetings and significant decisions.
7. Stoppages, delays, shortages, and losses.
8. Meter readings and similar recordings.
9. Emergency procedures.
10. Orders and requests of authorities having jurisdiction.
11. Change Orders received and implemented.
12. Change Directives received and implemented.
13. Services connected and disconnected.
14. Equipment or system tests and startups.
15. Partial completions and occupancies.
16. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At weekly 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.

B. Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility through Email.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer’s responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer’s responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals via Email, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Format: Arrange the following information in a tabular format:

a. Scheduled date for first submittal.
b. Specification Section number and title.
c. Submittal category: Action; informational.
d. Name of subcontractor.
e. Description of the Work covered.
f. Scheduled date for Engineer’s final release or approval.

g. Scheduled date of fabrication.
h. Scheduled dates for purchasing.
i. Scheduled dates for installation.
j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Engineer's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.

1. Engineer will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.

a. Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
b. Contractor shall execute an electronic file agreement.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer’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 7 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer 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 7 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Engineer's consultants, Owner, or other parties is indicated, allow 7 days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Engineer and to Engineer's consultants, allow 7 days for review of each submittal. Submittal will be returned to Engineer before being returned to Contractor.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file 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 enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Engineer and Owner, containing the following information:

    a. Project name.
    b. Date.
    c. Name of Engineer
    d. Name of Contractor.
    e. Name of firm or entity that prepared submittal.
    f. Names of subcontractor, manufacturer, and supplier.
    g. Category and type of submittal.
    h. Submittal purpose and description.
    i. Specification Section number and title.
    j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Indication of full or partial submittal.
    n. Transmittal number, numbered consecutively.
    o. Other necessary identification.
    p. Remarks.

E. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Engineer’s action stamp.

G. 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.

H. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer’s action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Provide electronic submittals as PDF electronic files to Engineer.

    a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Submit Product Data before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Engineer's digital data drawing files is otherwise permitted.

D. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

E. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

F. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

G. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

H. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of engineers and owners, and other information specified.

J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

P. Product Test Reports: Submit written reports indicating 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.

Q. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

R. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

S. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

T. Field Test Reports: Submit 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.

U. 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ENGINEER’S ACTION

A. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Engineer will review each submittal and will not return it or will return it if it does not comply with requirements. Engineer 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 Engineer.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Engineer without action.

END OF SECTION 013300

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 Engineer, Owner or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer.

C. 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.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer 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 Engineer for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed and not less than five days prior to preconstruction conference. Submit in format acceptable to Engineer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager shall not have other Project responsibilities.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: 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.
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.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

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

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

B. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. When testing is complete, remove test specimens, assemblies, 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 Engineer 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.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be the responsibility of the Contractor and will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Engineer 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.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute, via Email, schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Engineer.
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 Engineer’s reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "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

Statement of Special Inspections

Project: Improvements to Ebenezer Park Phase II Permit Number: _____

Project Location: 4490 Boatshore Road

Owner/Address: York County City Rock Hill Zip 29732

Registered Design Professional
In Responsible Charge: William J. Hannah

Address: 25 Woods Lake Road, Suite 210

City: Greenville State: SC Zip: 29607 Phone: 803-999-1482

E-mail: billh@adcengineering.com

This statement of Special Inspections attached is submitted as a condition for permit issuance in accordance with Section 1704 of the 2021 International Building Code. It includes a Schedule of Special Inspection Services applicable to the above referenced project as well as the identity of the individuals, agencies, or firms (completed by others) intended to be retained for conducting these inspections. The Special Inspection Coordinator (Registered Design Professional In Charge of Administering Special Inspections) shall keep records of all inspections and shall furnish interim inspection reports to the Engineer of Record (Registered Design Professional in Responsible Charge of Construction Documents) at a frequency agreed upon by the permit applicant and Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor and the Engineer of Record for correction. If the discrepancies are not corrected, the Special Inspection Coordinator shall bring the discrepancies to the attention of the Building Official and the Engineer of Record prior to the completion of that phase of work. The Special Inspection Coordinator shall submit a Final Report of Special Inspections to the building official at the conclusion of the project and before a certificate of occupancy will be issued.

Statement of Special Inspections encompass the following disciplines:

☒ Structural ☐ Mechanical/Electrical/Plumbing
☐ Architectural ☐ Other: _____

Prepared by:

William J. Hannah
Type or Print Name

Signature

06/06/2023
Date

Preparer's Seal and Signature Required

To be filled out by the jurisdiction and returned to applicant
Building Official's Acceptance of Special Inspections ☐ ☐

Frequency of Interim reports: Monthly Bi-Monthly ☐ Upon Completion ☐ Per Attached Schedule

Signature Date TMS Permit Number

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections includes the following building systems:

- ☒ Soils and Foundations
- ☒ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☒ Masonry
- ☒ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☒ Wood Construction
- ☐ Architectural Components
- ☐ Mechanical & Electrical Systems
- ☐ Storage Racks
- ☐ Spray Fire Resistant Material
- ☐ Special Cases

Special Inspection Agencies	**Firm**	**Address, Telephone, e-mail**
1. **Special Inspection Coordinator (Registered Professional in Responsible Charge of Administering Special Inspections)**		
2. Inspector		
3. Inspector		
4. Testing Agency		
5. Testing Agency		
6. Other		

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official and shall be in accordance with the building code or any particular requirements of the specifications or material specific referenced standards. The credentials of all Inspectors and testing technicians shall be provided if requested.

Special Inspection Definitions

Continuous Special Inspection - Special inspection by the special inspector who is present when and where the work to be inspected is being performed.

Periodic Special Inspection - Special inspection by the special inspector who is intermittently present where the work to be inspected has been or is being performed. Unless noted otherwise 100% of the work designated for inspection shall be inspected.

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1704.2.5 Special Inspection of Fabricated Items	
Structural Steel Fabrication: Verify Fabrication/Quality Control Procedures	Verify Steel Fabrication plant is AISC certified

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.1.1 Special Cases	
Post Installed Anchors	
Installer Qualifications	**Review** installer training records to confirm they have received manufacturer training per the contract documents
Anchor Installation	**Continuously** inspect complete process of anchor installation in accordance with requirements of approved ICC ESR report. As minimum review installation procedures including drill bit type, drilling methods, hole preparation and cleaning, spacing, edge distance, embedment depth, adhesive installation, rod installation, curing time, and anchor torque to ensure compliance with manufacturer's instructions and construction documents. (**All anchor holes must be inspected during drilling, all anchor holes must be inspected prior to anchor installation, all anchors shall be inspected at final application of required torque)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.2.1 Structural Steel	
Review fabricator's source quality assurance inspection and testing report submittals	**Periodically** review fabricator's source quality assurance inspection and test reports to ensure all inspection and testing is being completed as required and appropriate standards are being met. **(100% rate for all source quality control report submittals.)**
Conduct Inspections prior to field welding in accordance with AISC 360 Table N5.4-1	**Periodically** confirm welder qualification records and continuity records are current **Periodically** confirm that welding procedure specifications (WPS) are available and on site for type and configuration of weld being completed. **(100% rate for each type and configuration of weld immediately prior to the weld being completed)** **Periodically** confirm manufacturers certifications are available and on site for all welding consumables. **(100% rate for each type of consumable immediately prior to initial use of each consumable)** **Periodically** inspect material identification (type/grade) **Periodically** confirm that a welder identification system is in place for field welding and that the system is being used **(confirm system is in place prior to welding and 100% confirmation of system usage during welding inspection)** **Periodically** inspect fit-up of groove welds including joint preparation, dimensions, cleanliness, tacking, backing type and backing fit **(100% inspection rate of all groove weld joints immediately prior to completing weld)** **Periodically** inspect fit-up of groove welds of HSS T-, Y-, and K- joints without backing (including joint geometry) for: joint preparation, dimensions, cleanliness, and tacking. **(100% inspection rate of all groove weld joints immediately prior to completing weld)** **Periodically** inspect configuration and finish of weld access holes **(100% inspection rate of all weld access holes immediately prior to completing associated weld)** **Periodically** inspect fit-up of fillet welds including dimensions, cleanliness, and tacking **(Random inspection rate for general conformance with a minimum rate of once weekly during steel erection)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.2.1 Structural Steel (Continued)	
Conduct inspections during field welding in accordance with AISC 360-10 Table N5.4-2	**Periodically** confirm that welders are qualified for welds which they are completing and they possess a valid welding certificate for that weld type and configuration **(Random inspection rate for general conformance with a minimum rate of once weekly during welding operations)** **Periodically** inspect control and handling of welding consumables including packaging and exposure control. **(Random inspection rate for general conformance with a minimum rate of once weekly during welding operations)** **Periodically** confirm that no welding is occurring over cracked tack welds. **(Random inspection rate for general conformance with a minimum rate of once weekly during welding operations)** **Periodically** confirm that environmental conditions are acceptable including wind speed limits, precipitation and temperature. **(Random inspection rate for general conformance with a minimum rate of once weekly during welding operations)** **Periodically/Continuously** confirm that weld procedure specifications (WPS's) are being followed including settlings of welding equipment, travel speed, selected welding materials, shielding gas type and flow rate, preheat applied, interpass temperature maintained, and proper position. **(Continuously inspect for groove welds, multi-pass welds, or welds greater than 5/16". Periodically inspect all other welds a minimum rate of once weekly during welding operations)** **Periodically/Continuously** confirm welding techniques including interpass and final cleaning, each pass with profile limitations, each pass meets quality requirements. **(Continuously inspect for groove welds, multi-pass welds, or welds greater than 5/16". Periodically inspect all other welds a minimum rate of once weekly during welding operations)** **Periodically** inspect placement and installation of steel headed stud anchors. **(Random inspection rate for general conformance with a minimum rate of once daily during welding operations)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.2.1 Structural Steel (Continued)	
Conduct inspections after field welding in accordance with AISC 360-10 Table N5.4-3	**Periodically** confirm that welds have been cleaned. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** confirm weld size, length and location. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** confirm weld meets visual acceptance criteria including crack prohibition, weld/base-metal fusion, crater cross section, weld profiles, weld size, undercut, and porosity. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** inspect arc strikes. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** inspect k-area for cracks within 3” of welds when welding has been performed in k-area. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** inspect weld access holes in rolled heavy shapes and built-up heavy shapes and inspect those weld access holes for cracks. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** confirm backing and weld tabs have been removed where required. **(100% inspection rate with a minimum rate of once weekly during welding operations)**
(Continued) Conduct inspections after field welding in accordance with AISC 360-10 Table N5.4-3	**Periodically** inspect repair activities. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** document acceptance or rejection of welded joint or member. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** inspect no prohibited welds have been added without the approval of the EOR. **(100% inspection rate with a minimum rate of once weekly during welding operations)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.2.1 Structural Steel (Continued)	
Conduct Inspections prior to high strength bolting in accordance with AISC 360-10 Table N5.6-1	**Periodically** confirm manufacturers certifications are available each type of fastener material. **(100% rate for each type of fastener material immediately prior to initial use of each type of material)** **Periodically** confirm fasteners are marked in accordance with ASTM Standard. **(Random inspection rate for general conformance with a minimum rate of once weekly during bolting operations)** **Periodically** confirm correct fasteners are selected for the joint detail including grade, type, and bolt length (if threads are to be excluded from shear plane). **(100% inspection rate)** **Periodically/Continuously** confirm correct bolting procedure selected for joint detail. **(100% inspection rate, continuous inspection for slip critical joints, periodic inspection for all other joints with random inspection with a minimum rate of once weekly during bolting operations)** **Periodically/Continuously** inspect connection elements, including appropriate faying surface condition and hole preparation meet applicable requirements. **(continuous inspection for slip critical joints with 100% inspection rate, periodic inspection for all other joints with random inspection with a minimum rate of once weekly during bolting operations)** **Periodically/Continuously** Conduct Preinstallation verification testing by installation personnel and document for fastener assemblies and methods used for slip critical joints. **(Periodically, one time per installer for turn of nut, direct tension indicators, or tension controlled bolts. Periodically, once daily for calibrated wrench without match marking)** **Periodically** confirm protected storage provided for bolts, nuts, washers and other fastener components. **(Random inspection rate for general conformance with a minimum rate of once weekly during bolting operations)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.2.1 Structural Steel (Continued)	
Conduct Inspections during high strength bolting in accordance with AISC 360-10 Table N5.6-2	**Periodically/Continuously** confirm fastener assemblies placed in all holes and washers are positioned as required. **(100% inspection rate, continuous inspection for slip critical joints, periodic inspection for all other joints with random inspection with a minimum rate of once weekly during bolting operations)** **Continuously** confirm joints are brought to the snug-tight condition prior to pretensioning operation **(100% inspection rate, continuous inspection for slip critical joints)** **Continuously** component not turned by the wrench is prevented from rotating **(100% inspection rate, continuous inspection for slip critical joints)** **Periodically/Continuously** confirm fasteners are pretensioned in accordance with the RCSC Specification, progressing systematically from the most rigid point toward the free edges **(100% inspection rate, continuous inspection for slip critical joints pretensioned with calibrated wrench or turn-of-the-nut without match marking. Periodic inspection for slip critical joints pretensioned with tension controlled bolts, direct tension indicators, or turn-of-the-nut with match marking**
Conduct Inspections after high strength bolting in accordance with AISC 360-10 Table N5.6-3	**Periodically** document acceptance or rejection of bolted connections. **(100% rate with a minimum rate of once weekly during welding operations)**
Other inspection Task	**Periodically** inspect placement of anchor rods and other embedded items prior to concrete/masonry grout placement operations. Confirm diameter, grade, type and length of the anchor rod or embedded item, and the extent or depth of embedment into concrete/masonry grout. **(100% inspection rate immediately prior to concrete/masonry grout placement operation)** **Periodically** inspect the steel frame to verify compliance with the details shown on the construction documents including braces, stiffeners, member locations, and proper application of joint details at each connection. **(100% inspection rate with a minimum rate of once weekly during steel erection operations)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.3 Concrete Construction	
Inspection of reinforcing steel and placement	**Periodically** inspect reinforcing steel placement in accordance with contract documents and approved shop drawings to confirm size, spacing, cover, positioning, bends, grade, laps, supports and anchorage. **(100% inspection rate immediately prior to placing concrete)**
Inspection of anchors cast in concrete	**Periodically** inspect size, positioning, embedment, and projection of anchor rods is in accordance with contract documents and approved shop drawings. **(100% inspection rate immediately prior to placing concrete)** **Continuously** inspect concrete placement and consolidation around anchors. **(100% inspection rate during concrete placement)**
Inspection of anchors post-installed in hardened concrete members.	**Review** installer training records to confirm they have received manufacturer training per the contract documents **Continuously** inspect complete process of anchor installation in accordance with requirements of approved ICC ESR report. As minimum review installation procedures including drill bit type, drilling methods, hole preparation and cleaning, spacing, edge distance, embedment depth, adhesive installation, rod installation, curing time, and anchor torque to ensure compliance with manufacturer's instructions and construction documents. (**All anchor holes must be inspected during drilling, all anchor holes must be inspected prior to anchor installation, all anchors shall be inspected at final application of required torque)**
Verifying use of required design mix	**Periodically** review batch tickets to confirm the appropriate approved mix design is being used for the location in which concrete is being placed **(100% review rate during concrete placement)** **Periodically** verify that water added at the site does not exceed that allowed by the batch ticket **(100% inspection rate during concrete placement)**

1705.3 Concrete Construction (Continued)	
Sample fresh concrete to fabricate specimens for strength tests, perform fresh unit weight density, slump and air content tests, and determine the temperature of concrete	**Continuously** test concrete compressive strength (ASTM C31 & C39), fresh unit weight density (ASTM C138), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064). Samples for preparing unit weight density specimens and measuring air content shall be obtained at the point of placement. Slump measurements are for reference only and shall not be a basis of rejection. Threshold for fresh unit weight density shall be in accordance with approved mix design submittals (**Frequency of sampling and testing as required by section 21.16 of ACI 318)**
Inspection of concrete for proper application techniques	**Continuously** inspect concrete placement techniques to confirm compliance with section 26.5 of ACI 318.
Inspection for maintenance of specified curing temperatures and techniques	**Periodically** inspection curing temperatures and techniques to insure compliance with contract documents and sections 26.5.3, 26.5.4 and 26.5.5 of ACI 318-14
Inspection of formwork for shape, location and dimensions of concrete member being formed	**Periodically** inspect formwork to ensure compliance with dimensions of members indicated on contract documents **(100% inspection rate during concrete placement)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.4 Masonry Construction	
Verify compliance with approved submittals	**Periodically** review batch tickets to confirm the appropriate approved grout mix design is being used. **(100% review rate during grout placement)** **Periodically** review mortar materials to confirm compliance with approved submittals. **(A minimum of once weekly during masonry construction)**
Verify proportions of site prepared mortar	**Periodically** inspect proportioning, mixing and re-tempering of mortar. **(A minimum of once daily during masonry construction)**
Inspect construction of mortar joints	**Periodically** inspect construction of mortar joints including tooling and filling of head joints. **(100% inspection rate a minimum of once daily during masonry construction)**

Inspect location of reinforcement and connectors	**Periodically** inspect placement, positioning and lapping of reinforcing steel **(100% inspection rate a minimum of once daily during masonry construction)** **Periodically** inspect size, grade and type of reinforcing. **(100% inspection rate a minimum of once daily during masonry construction)** **Continuously** inspect placement positioning and lapping of joint reinforcement. **(100% Inspection rate – inspector shall be in the area of masonry work to monitor installation)** **Periodically** inspect size, grade, type and location of anchor rods and embeds. **(100% inspection rate a minimum of once daily during masonry construction)**
Inspect Grout Space	**Periodically** grout spaces to ensure minimum clear grout spaces are achieved, and that grout spaces are free from debris, mortar fins and mortar droppings. Confirm mortar fins and mortar droppings are being manually removed as masonry is constructed. **(100% inspection rate a minimum of once daily during masonry construction)**
Verify proportions of site prepared grout	**Periodically** inspect proportioning, mixing and re-tempering of mortar. **(A minimum of once daily during masonry construction)**
Proportions of site prepared grout	**Continuously** inspect proportioning and mixing of site batched grout. Confirm acceptable measurement devices are being employed and that the mix proportions are in accordance with approved submittals.
Verify size and location of structural masonry elements	**Periodically** inspect the size and location of structural elements to comply with contract drawings. **(100% inspection rate a minimum of once daily during applicable portion of the work)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.4 Masonry Construction (Continued)	
Verify protection of masonry during hot/cold weather	**Periodically** inspect protection of masonry during cold weather (temperature below 40 deg F) or hot weather (temperature above 90 deg F) **Periodically** verify that all wall cavities are protected against precipitation. **(100% inspection rate a minimum of once daily during applicable portion of the work)**
Verify grout placement complies with code and construction document provisions	**Continuously** inspect placement, consolidation and reconsolidation of grout. **(100% inspection rate)** **Continuously** verify grouting and grout consolidation procedures are in accordance with code and contract document provisions. **(100% inspection rate)**
Evaluation of grout Strength	**Continuously** Test compressive strength of grout samples (ASTM C1019). (**Sample and test grout for every 5000 sq ft. of wall, but not less than one set of samples for each day's worth of grouting)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.6 Soils	
Verify materials below shallow foundations are adequate to achieve the design bearing capacity	**Periodically** inspect soils within building footprint for adequate bearing capacity and consistency with the geotechnical report**.** **(100% inspection rate)**
Verify excavations are extended to proper depth and have reached proper material	**Periodically** inspect all footing excavations to ensure they are to proper depth and have reached proper material as indicated on contract documents and/or geotechnical report. **(100% inspection rate immediately prior to placement to reinforcing steel for foundations)** **Periodically** inspect all unsuitable material excavations to ensure they are to proper depth and have reached proper material as indicated on contract documents and/or geotechnical report. **(100% inspection rate of all areas of unsuitable fill removal immediately prior to placement of fill)**
Perform classification testing of compacted fill materials.	**Periodically** perform testing of fill materials to ensure compliance with contract documents and geotechnical report. Classification and testing shall be in accordance with the Geotechnical report. Where the geotechnical report does not specifically indicate testing, the minimum testing shall be sieve tests (ASTM D422 & D1140) and Standard Proctor tests (ASTM D98). **(Testing shall be completed for each source of material, or where obvious changes of properties of fill materials are realized)**
Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill	**Continuously** verify materials for compacted fill to ensure materials have been previously tested and are in compliance with the contract documents and geotechnical report. **(100% inspection rate)** **Periodically** test density of each lift of fill within the building footprint to confirm compliance with compaction requirements outlined in the contract documents and geotechnical report. **(Where inspection rates are not indicated in the geotechnical report, not less than one test per each lift per 2000 sq ft of fill placed)** **Continuously** verify lift thicknesses are during placement of compacted fill to ensure lift thickness is in compliance with the contract documents and geotechnical report. **(100% inspection rate)**
Prior to placement of compacted fill, inspect subgrade and verify that the site has been prepared properly.	**Periodically** inspect subgrade within the building footprint prior to placement of compacted fill to ensure subgrade complies with contract documents and geotechnical report. **(100% inspection rate of all areas immediately prior to placement of fill)**

SECTION 014000.02 – CONTRACTORS STATEMENT OF RESPONSIBILITY

Each contractor responsible for the construction of a main wind force or seismic force resisting system, designated, seismic system or a wind or seismic resisting component listed in the statement of special inspections shall submit a Statement of Responsibility. The statement shall be submitted prior to the commencement of work on the system or component.

Project:

Contractor's Name:

Address:

License No.:

Description of designated building systems and components included in the Statement of Responsibility:

Contractor's Acknowledgment of Special Requirements

I hereby acknowledge that I have received, read, and understand the special requirements contained in the statement of special inspections.

I hereby acknowledge that control will be exercised to obtain conformance with the construction documents approved by the Building Official.

_____ _____

Signature Date

Contractor's Provisions for Quality Control

List (or attach) procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of reports.

List (or attach) Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2.5 of the International Building Code must submit a *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project:

Fabricator's Name:

Address:

Certification or Approval Agency:

Certification Number:

Date of Last Audit or Approval:

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

_____ _____
Signature Date

_____
Title

Attach copies of fabricator's certification or building code evaluation service report.

FINAL REPORT OF SPECIAL INSPECTIONS

Project:_____ Application No.. _____

Project location: _____

Project Owner: _____

Address: _____

SC Registered Design
Professional in Responsible Charge: _____

Firm (optional): _____

License No.. SC_____ Phone:_____ Fax:_____

Address: _____

To the best of my information, knowledge, and belief, the Special Inspections and/or Testing required for this project, and designated for this Agent in the *Statement of Special Inspections* submitted for permit have been completed in accordance with the contract documents.

Field reports submitted prior to this *Final Report of Inspections form* a basis for, and are to be considered an integral part of this Final Report. All discrepancies that were outstanding in all of the Field reports have been corrected.

Prepared by: Special Inspection Coordination

_____
Type or print name

_____
Firm (optional)

_____
Signature Date

Individual Seal

Firm Seal

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.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to Engineer, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 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.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temporary construction signs shall be provided.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITY INSTALLATION

A. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

3.2 SUPPORT FACILITIES INSTALLATION

A. Temporary Roads and Laydown Areas: Construct and maintain temporary roads and laydown areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.

B. 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.

C. Parking: Provide temporary parking areas for construction personnel.

D. 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.

E. Project Signs: Provide Project SWPPP signs as indicated. Unauthorized signs are not permitted.
1. 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 and “No Entry” signs.

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to

erosion- and sedimentation-control Drawings, requirements of NPDES Construction General Permit and authorities having jurisdiction.

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.

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 per Clemson University tree protection policy. Protect tree root systems from damage, flooding, and erosion.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

3.4 OPERATION, TERMINATION, AND REMOVAL

A. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary site fencing.
2. Section 311000 "Site Clearing" for removing existing trees and shrubs.

1.3 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inches (150 mm) above the ground for trees up to and including 4-inch (100-mm) size at this height and as measured at a height of 12 inches (300 mm) above the ground for trees larger than 4-inch (100-mm) size.

B. (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape at a height 54 inches (1372 mm) above the ground line.

C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
   a. Quality-control program.
   b. Coordination of Work and equipment movement with the locations of protection zones.
   c. Trenching by hand or with air spade within protection zones.
   d. Field quality control.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.
2. Detail fabrication and assembly of protection-zone fencing and signage.
3. Indicate extent of trenching by hand or with air spade within protection zones.

C. Samples: For each type of the following:

1. Organic Mulch: 1-pint (0.5-L) volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.

D. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1. Species and size of tree.
2. Location on site plan. Include unique identifier for each.
3. Reason for pruning.
4. Description of pruning to be performed.
5. Description of maintenance following pruning.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For arborist and tree service firm.

B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

E. Quality-control program.

1.7 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA.

B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.

C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.8 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Soil: Stockpiled soil mixed with planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Mixture: Well-blended mix of two parts stockpiled soil to one-part planting soil.

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.
2. Size Range:3 inches (76 mm) maximum, 1/2- inch (13 mm) minimum.
3. Color: Natural.

C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements.

1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch (50-mm) maximum opening in pattern and weighing a minimum of 0.4 lb/ft. (0.6 kg/m); remaining flexible from minus 60 to plus 200 deg F (minus 16 to plus 93 deg C); inert to most chemicals and acids; minimum tensile yield strength of 2000 psi (13.8 MPa) and ultimate tensile strength of 2680 psi (18.5 MPa); secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches (2400 mm) apart.

a. Height: 54 inches (1200 mm).
b. Color: High-visibility orange, nonfading.
c. “Tree Protection Zone -Keep Out” sign. See detail.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag each tree trunk at 54 inches (1372 mm) above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 2-inch (50-mm) uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches (150 mm) of tree trunks.

3.3 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.

B. Maintain protection zones free of weeds and trash.

C. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete, and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.

D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows**:**

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Cut Ends: Do not paint cut root ends.
3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."

B. Root Pruning at Edge of Protection Zone: Prune tree flush with the edge of the protection zone by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune as directed by arborist.

1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).

    a. Type of Pruning: Cleaning, raising, reducing, and thinning where indicated.

B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.

C. Cut branches with sharp pruning instruments; do not break or chop.

D. Do not paint or apply sealants to wounds.

E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.

F. Chip removed branches dispose of off-site.

3.7 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.

1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

D. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Trees: Remove and replace trees indicated to remain that are more than 66 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Small Trees: Provide new trees of same size and species as those being replaced for each tree that measures 4 inches (100 mm) or smaller in caliper size.
2. Large Trees: Provide one new tree(s) of 4-inch (100-mm) caliper size for each tree being replaced that measures more than 4 inches (100 mm) in caliper size.
3. Plant and maintain new trees as specified in Section 329300 "Plants."

C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 2-inch (50-mm) uniform thickness to remain.

D. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 feet (3 m) beyond drip line and no closer than 36 inches (900 mm) to tree trunk. Drill 2-inch- (50-mm) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) o.c. Backfill holes with an equal mix of augered soil and sand.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for requests for substitutions.
2. Section 012550 “Proposed Substitution Request form”

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved by Landscape 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 specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. 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. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Landscape Architect's Action: If necessary, Landscape Architect will request additional information or documentation for evaluation within seven days of receipt of a comparable product request. Landscape Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. Form of Landscape Architect's Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
    b. Use product specified if Landscape Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

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

1. 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, Landscape Architect will determine which products shall be used.

B. Identification of Products: Except for required labels and operating data, do not 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 product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. 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 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Landscape Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

    a. Submit additional documentation required by Landscape Architect in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Landscape Architect whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: …"

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: …"

3. 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.

    a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: …"

4. 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, which 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: …"

5. 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.

    a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: …"

6. 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, which 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: …"

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

    a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require "match Landscape Architect's sample," provide a product that complies with requirements and matches Landscape Architect's sample. Landscape Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Landscape Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Landscape Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Landscape Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Landscape Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
2. Evidence that proposed product provides specified warranty.
3. List of similar installations for completed projects with project names and addresses and names and addresses of Landscape Architects and owners, if requested.
4. Samples, if requested.

B. Submittal Requirements: Approval by the Landscape Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

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. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - EXECUTION

2.1 EXAMINATION

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

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.

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.
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.

2.2 PREPARATION

A. Existing Utility Information: Furnish information to Engineer 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. 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 to Engineer according to requirements in Section 013100 "Project Management and Coordination."

2.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer 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 Engineer 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. 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 Engineer.

2.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing temporary 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 Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. 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.

2.5 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.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. 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.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

2.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

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. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

F. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

G. 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.

H. 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.

I. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

2.7 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.

END OF SECTION 017300

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. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 017300 "Execution" for progress cleaning of Project site.
2. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 ACTION SUBMITTALS

A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

B. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Engineer’s signature for receipt of submittals.

5. Submit test records.

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 that are incomplete.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer 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 Engineer, that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection 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.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Engineer’s Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

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, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Engineer
d. Name of Contractor.
e. Page number.

2. Submit list of incomplete items in the following format:

a. PDF electronic file. Engineer will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Provide digital copies via email of all warranty documents in an orderly sequence based on the table of contents of Project Manual.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. 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.

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. Remove tools, construction equipment, machinery, and surplus material from Project site.

B. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

END OF SECTION 017700

SECTION 017839 - PROJECT RECORD DOCUMENTS

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 project record documents, including the following:

1. Red-line As-built Drawings.
2. Red-line As-built Specifications.
3. Record Product Data.
4. As-built Survey

B. Related Requirements:

1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.

1.3 CLOSEOUT SUBMITTALS

A. Red-line As-built Drawings: Comply with the following:

1. Number of Copies: Submit copies of record Drawings as follows:

a. Two paper copy sets of Contractor red-line as-built drawings
b. Contractor certification statement which confirms their completeness and accuracy.
c. PDF electronic files of scanned red-line as-built drawings and Contractor certification statement.
d. The contractor provided pdf's will be converted to AutoCAD 2018 by the design team.

B. Red-line As-built Specifications: Submit one paper copy set of Contractor Red-line As-built specifications and PDF electronic files of scanned Red-line As-built specifications.

C. Record Product Data: Submit one paper copy, paper copies and annotated PDF electronic files and directories of each of the following:

1. Contractor Submittals.
2. Request for Information.
3. Supplemental Instructions.
4. Product Warranties

PART 2 - PRODUCTS

2.1 RED-LINE AS-BUILT (RECORD) DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcon-

tractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Accurately record information in an acceptable drawing technique.

c. Record data as soon as possible after obtaining it.

d. Record and check the markup before enclosing concealed installations.

e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Change Directive.
k. Changes made following Engineer's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "CONTRACTOR RED-LINE AS-BUILT" in a prominent location.

1. Red-line As-built Prints.

C. The contractor provided pdf's will be converted to AutoCAD 2018 by the design team.

2.2 RED-LINE AS-BUILT SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders and record Drawings where applicable.

2.3 RECORD PRODUCT DATA

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

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

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

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

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

END OF SECTION 017839

SECTION 023200 - GEOTECHNICAL INVESTIGATIONS

PART 1 - GENERAL

1.1 SUMMARY OF WORK:

A. This section covers all work associated with soil and subsurface investigations.

B. Soil and subsurface investigations were conducted at the site, the results of which are to be found in the report issued by Summit Engineering, dated March 15, 2023. A copy of the above report is attached for review. Bidders are urged to examine the soils investigation data and may make their own investigation of the site before bidding.

1.2 CRITERIA FOR BIDDING

A. Soil investigation data is provided only for information and the convenience of the bidders. The Owner, Architect and Engineer disclaim any responsibility for interpretation of that data by bidders, as in predicting soil bearing values, rock profiles, soil stability and the presence, level and extent of underground water.

B. Soil investigation data is not part of the contract documents.

1.3 SUBMITTALS

A. None this section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 023200

SUMMIT
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A Universal Engineering Sciences Company

REPORT OF GEOTECHNICAL PRELIMINARY SUBSURFACE EXPLORATION
EBENEZER PARK PHASE II IMPROVEMENTS
BOATSHORE ROAD
ROCK HILL, SOUTH CAROLINA

SUMMIT PROJECT NO. 6752.G0007.R1

Prepared For:

Mr. Fred Guthier, PLA, LEED AP
ADC Engineering
25 Woods Lake Road
Greenville, South Carolina 29607
Email: fredg@adcengineering.com

Prepared By:

SUMMIT Engineering, Laboratory & Testing, Inc. (**SUMMIT**)
3575 Centre Circle Drive
Fort Mill, South Carolina 29715

March 15, 2023

March 15, 2023

Mr. Fred Guthier, PLA, LEED AP
ADC Engineering
25 Woods Lake Road
Greenville, South Carolina 29607
Email: fredg@adcengineering.com

SUMMIT
ENGINEERING • LABORATORY • TESTING
A Universal Engineering Sciences Company

Subject: **Report of Geotechnical Preliminary Subsurface Exploration**
Ebenezer Park Phase II Improvements
Boatshore Road
Rock Hill, South Carolina
SUMMIT Project No. 6752.G0007.R1

Dear Mr. Guthier:

SUMMIT Engineering, Laboratory & Testing, Inc. (**SUMMIT**) has completed a preliminary geotechnical subsurface exploration for the Ebenezer Park Phase II Improvements site located off Boatshore Road in Rock Hill, South Carolina. This subsurface exploration was performed in general accordance with our Proposal No. 6752.G0007.R1 dated April 12, 2022. This report contains a brief description of the project information provided to us, general site and subsurface conditions revealed during our geotechnical subsurface exploration and our general recommendations regarding foundation design and construction.

SUMMIT appreciates the opportunity to be of service to you on this project. If you have any questions concerning the information presented herein or if we can be of further assistance, please feel free to call us at (704) 504-1717.

Sincerely yours,
SUMMIT Engineering, Laboratory & Testing, Inc.

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER
No. 39191
L. Brian Cantrell
3/15/2023
L. BRIAN CANTRELL

SOUTH CAROLINA
SUMMIT ENGINEERING, LABORATORY & TESTING, INC.
No. 5545
CERTIFICATE OF AUTHORIZATION

L. Brian Cantrell
Brian Cantrell, P.E.
Geotechnical Department Manager

Adam Jordan
Assistant Project Manager

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3575 Centre Circle Drive, Fort Mill, SC 29715
summit-companies.com

EXECUTIVE SUMMARY

SUMMIT has completed a preliminary geotechnical subsurface exploration for the Ebenezer Park Phase II Improvements project. The purpose of this exploration was to obtain general information regarding the subsurface conditions and to provide geotechnical recommendations regarding foundation support of the proposed construction as well as depth checks for the current asphalt. This exploration consisted of nine (9) soil test borings (identified as B-1 through B-4 and B-6 through B-11) and six (6) surface material depth check borings (identified as P-1 through P-6). Boring B-5 was removed due to underground utilities that could not be located. The approximate test locations are shown on Figure 2 provided in Appendix 1. The following geotechnical engineering information was obtained as a result of the soil test borings:

- **Surface Materials –** Surficial organic (topsoil) soils were observed at the existing ground surface of four (4) of the borings with estimated thicknesses ranging from approximately 3 to 5 inches. Asphalt was encountered in three (3) of the borings at the existing ground surface with approximate thicknesses ranging from 3 to 6 inches. At the existing ground surface or underlying the asphalt, aggregate base course (gravel)/stone was encountered in seven (7) of the borings with approximate thicknesses ranging from 3 to 6 inches.
- **Existing Fill Soils -** Existing fill (disturbed) soils were encountered beneath the surface materials in five (5) of the borings performed in this exploration to approximate depths ranging from below the surface materials to 3 feet below the existing ground surface. When sampled, the existing fill soils generally consisted of elastic silts (MH), sandy silts (ML), and silty sands (SM). The Standard Penetration Resistances (SPT N-values) in the existing fill soils were 25 blows per foot (bpf).
- **Residual Soils -** Residual (undisturbed) soils were encountered below the surface materials and/or existing fill soils and extended to the maximum boring termination depth. These residual soils generally consisted of elastic silts (MH), sandy silts (ML), and silty sands (SM). The Standard Penetration Resistances (SPT N-values) in the residual soils ranged from 0 to 13 bpf.
- **Partially Weathered Rock (PWR), Auger Refusal and Groundwater Levels –** Partially weathered rock (PWR), auger refusal conditions, and groundwater at time of drilling were not encountered in the borings performed for this exploration.
- **Foundation Support -** Based on the results of our borings, the proposed structures can be adequately supported on shallow foundation systems provided site preparation and compacted fill recommendation procedures outlined in this report are implemented concerning unsuitable soils such as existing fill soils and soils with N-values less than 6 bpf. An allowable net bearing pressure of up to 2,000 pounds per square foot (psf) can be used for design of the foundations bearing on approved undisturbed residual soils, or on structural fill compacted to at least 95 percent of its Standard Proctor maximum dry density.
- **Seismic Site Class –** We have determined the Seismic Site Classification for this project site in accordance with Chapter 20 of ASCE 7 “Minimum Design Loads Criteria for Buildings and

Other Structures, Site Class Definitions using SPT N-Values. We recommend this project be designed using a Seismic Site Class of "E" (Soft soil profile) as defined in Table 20.3-1.

- **Special Construction Considerations:** Special considerations are warranted concerning existing fill soils and soils with SPT N-values less than 6 bpf. Dependent on final grades, the contractor can anticipate that some undercutting and/or foundation extension may be necessary through unsuitable soils if encountered during grading and construction. Should unsuitable soils be encountered during the grading and construction activities, these soils should be inspected in the field by a Geotechnical Engineer-of-Record and/or their designee prior to remediation. Additional testing such as test pit excavations and/or hand auger borings may be required in order to further explore these soil conditions, depths and locations.
    - Existing Fill Soils: At the time of this report, no relevant information (documentations) regarding previous grading activities, prior materials testing, and/or geotechnical engineering services was provided for our review. Five (5) of the borings encountered undocumented fill soils (fill soils not monitored and tested during placement). Undocumented fill poses risks associated with undetected deleterious materials within the fill soils and/or deleterious material at the interface between the fill soils and residual soils.
    - Soils with SPT N-values less than 6 bpf: Soils that exhibited SPT N-values less than 6 bpf are considered not suitable for the direct support of the proposed construction. These soil conditions were encountered in all of the borings except Boring B-4 at various depths. Typically, the remediation recommendation(s) of these soil conditions are developed at the time of inspection based on the additional testing results. Dependent on the test results and final grades, the remediation recommendation(s) could include, but not limited to, undercut and replacement with structural fills and/or foundation extension.

Please note that the information provided in this executive summary is intended to be a brief overview of project information and recommendations from the geotechnical report. The information in the executive summary should not be used without first reading the geotechnical report in its entirety and the recommendations described therein.

1.0 INTRODUCTION

1.1. Site and Project Description

The Ebenezer Park Phase II Improvements site is located off Boatshore Road in Rock Hill, South Carolina. A vicinity map showing the project's general location is provided as Figure 1. The subject property is comprised of York County Tax Parcel ID Numbers 586000002 and 586000012. At the time of our field exploration, the subject site was an existing RV campground with associated roadways and amenities.

The Client (ADC Engineering) provided **SUMMIT** a plan sheet titled that indicated the configurations of the proposed construction planned for this project. Based on the provided information, we understand the project is planned to include new restroom buildings for the lake and campground, asphalt paved campground driveways, a paved camper parking, picnic and fire pit areas, a repaved road from the gate to the round-a-bout, and boat parking.

At the time of report preparation, **SUMMIT** had not been provided structural details of the planned construction indicating proposed loads, foundation bearing elevations, or finished floor elevations. For this report, **SUMMIT** assumed the proposed structures will be supported on a shallow foundation system consisting of spread, strip, and/or combined footings and that wall loads will be on the order of 1 to 3 kips per foot and column loads on the order of 10 to 15 kips. Also, grading plans were not available at the time of this report and we have assumed that maximum cut/fill depths will be on the order of 1 to 3 feet over the existing ground surface.

1.2. Purpose of Subsurface Exploration

The purpose of this exploration was to obtain general geotechnical information regarding the subsurface conditions and to provide general preliminary recommendations regarding the geotechnical aspects of site preparation and foundation design. This report contains the following items:

- General subsurface conditions,
- Boring logs and an approximate “Boring Location Plan”,
- Suitable foundation types,
- Allowable bearing pressures for design of shallow foundations,
- Anticipated excavation difficulties during site grading and/or utility installation,
- Remedial measures to correct unsatisfactory soil conditions during site development, as needed,
- Drainage requirements around structures and under floor slabs, as needed,
- Construction considerations,
- Pavement subgrade support guidelines,
- Recommendations on pavement section thicknesses for light-duty pavement sections,
- Seismic Site Classification Based on SPT N-Values.
- Laboratory Test Results.

2.0 EXPLORATION PROCEDURES

2.1. Field Exploration

SUMMIT visited the site on December 13th and 14th of 2022 and performed a subsurface exploration that consisted of ten (10) soil test borings (identified as B-1 through B-4 and B-5 through B-11). Boring B-5 was removed due to underground utilities that could not be located. **SUMMIT** returned to the site on February 28th of 2023 and drilled six (6) roadway borings (identified as P-1 through P-6). The approximate locations of the borings are shown on the Figure 2 - "Boring Location Plan" provided in Appendix 1. The borings were located by professionals from our office using the provided plan, recreation-grade handheld GPS, existing topography, and aerial maps as reference. Since the boring locations were not surveyed, the location of the borings should be considered approximate.

The soil test borings were performed using a track mounted Geoprobe 7822DT and extended to approximate depths of 10 to 20 feet below the existing ground surface for the structural borings and 0.5 to 1 foot below the existing ground surface. Hollow-stem, continuous flight auger drilling techniques were used to advance the borings into the ground. Standard Penetration Tests (SPT) were performed within the mechanical borings at designated intervals in general accordance with ASTM D 1586. The SPT "N" value represents the number of blows required to drive a split-barrel sampler 12 inches with a 140-pound hammer falling from a height of 30 inches. When properly evaluated, the SPT results can be used as an index for estimating soil strength and density. In conjunction with the penetration testing, representative soil samples were obtained from each test location and returned to our laboratory for visual classification in general accordance with ASTM D 2488. Water level measurements were attempted at the termination of drilling. The results of these tests are presented on the individual boring logs provided in Appendix 2 at the respective test depth.

3.0 AREA GEOLOGY AND SUBSURFACE CONDITIONS

3.1. Physiography and Area Geology

The subject property is located in Rock Hill, South Carolina, which is located in the south-central Piedmont Physiographic Province. The Piedmont Province generally consists of well-rounded hills and ridges which are dissected by a well-developed system of draws and streams. The Piedmont Province is predominantly underlain by metamorphic rock (formed by heat, pressure and/or chemical action) and igneous rock (formed directly from molten material) which were initially formed during the Precambrian and Paleozoic eras. The volcanic and sedimentary rocks deposited in the Piedmont Province during the Precambrian era were the host of the metamorphism and were generally changed to gneiss and schist. The more recent Paleozoic era had periods of igneous emplacement, with episodes of regional metamorphism resulting in the majority of the rock types seen today.

The topographic relief found throughout the Piedmont Province has developed from differential weathering of theses igneous and metamorphic rock formations. Ridges developed along the more easily weathered and erodible rock. Because of the continued chemical and physical weathering, the rocks in the Piedmont Province are generally covered with a mantle of soil that has weathered in-place from the parent bedrock below. These soils have variable thicknesses and are referred to as residual soils, as they are the result of in-place weathering. Residual soils are typically fine-grained and have a higher clay content near the ground surface because of the advanced weathering. Similarly, residual soils typically become more coarse-grained with increasing depth because of decreased weathering. As weathering decreases with depth, residual soils generally retain the overall appearance, texture, gradation and foliations of their parent rock.

3.2. Generalized Subsurface Stratigraphy

General subsurface conditions observed during our geotechnical exploration are described herein. For more detailed soil descriptions and stratifications at a particular field test location, the respective "Boring Logs", provided in Appendix 2 should be reviewed. The horizontal stratification lines designating the interface between various strata represents approximate boundaries. Transitions between different strata in the field may be gradual in both the horizontal and vertical directions. Therefore, subsurface stratigraphy between test locations may vary.

3.2.1. Surface Materials

Surficial organic (topsoil) soils were observed at the existing ground surface in four (4) of the borings with thicknesses ranging from approximately 3 to 5 inches. Asphalt was encountered in three (3) of the borings at the existing ground surface with approximate thicknesses ranging from 3 to 6 inches. At the existing ground surface or underlying the asphalt, aggregate base course (gravel)/stone was encountered in seven (7) of the borings with approximate thicknesses ranging from 3 to 6 inches.

The surficial materials provided in this report and on the individual "Boring Logs" are based on observations of field personnel and should be considered approximate. Please note that the thickness of surface materials at the site should be expected to vary, and measurements necessary for detailed quantity estimation were not performed for this report. For planning purposes, we suggest considering a topsoil thickness of about 12 inches to account for existing vegetation and shallow roots.

Surficial Organic Soil is typically a dark-colored soil material containing roots, fibrous matter, and/or other organic components, and is generally unsuitable for engineering purposes. **SUMMIT** has not performed any laboratory testing to determine the organic content or other horticultural properties of the observed surficial organic soils. Therefore,

the phrase "surficial organic soil" is not intended to indicate suitability for landscaping and/or other purposes.

3.2.2. Alluvial Soils

Alluvial (water-deposited) soils were not encountered in any of the borings performed during this exploration. Alluvial soils are typically encountered in or near drainage features, pond bottoms, creeks and in low-lying areas. Alluvial soils are generally loose and/or under-compacted and, as such, are typically unsuitable for supporting the proposed construction. Therefore, remediation may be required wherever alluvial soils are encountered during grading activities. If these soils are encountered during site grading activities, the extent of the alluvial soils should be inspected in the field by the Geotechnical Engineer-of-Record or and/or their designee. Additional testing such as test pit excavations and/or hand auger borings may be required in order to further explored the alluvial soils.

3.2.3. Existing Fill Soils

Existing fill (disturbed) soils were encountered beneath the surface materials in five (5) of the borings to approximate depths ranging from below the surface materials to 3 feet below the existing ground surface. When sampled, the existing fill soils generally consisted of elastic silts (MH), sandy silts (ML), and silty sands (SM). The Standard Penetration Resistances (SPT N-values) in the existing fill soils were 25 blows per foot (bpf).

The following table summarizes the locations and approximate depths that existing fill soils were encountered in the borings performed for this exploration.

Summary Table of Existing Fill Soils Depths

Boring No.	Existing Fill Soil Approx. Depth, (feet)[1]	Boring No.	Existing Fill Soil Approx. Depth, (feet)[1]
B-1	3	B-8	1
B-2	1.5	B-11	1
B-3	1		

[1]Depths were measured from the existing ground surface at the time drilling was performed.

Based on historical aerial photographs and our site observations, previous grading activities and/or development have occurred on the property. As such, the contractor should anticipate the presence of fill soils, active or abandoned utility lines, and/or construction debris that were not encountered in the borings performed for this exploration.

If fill soils are encountered at other locations in the field during construction, the fill soils should be inspected by the Geotechnical Engineer-of-Record and/or their designee, with respect to the criteria outlined in Section 5.0 of this report.

3.2.4. Residual Soils

Residual (undisturbed) soils were encountered below the surface materials and existing fill soils and extended to the maximum termination depth. These residual soils generally consisted of soft to stiff elastic silts (MH), very soft to stiff sandy silts (ML), and very loose to loose silty sands (SM). The Standard Penetration Resistances (SPT N-values) in the residual soils ranged from 0 to 13 bpf.

3.2.5. Partially Weathered Rock and Auger Refusal

Partially weathered rock (PWR) and auger refusal conditions were not encountered in the borings performed for this exploration. PWR is defined as soil-like material exhibiting SPT N-values in excess of 100 bpf. Auger refusal is defined as material that could not be penetrated by the drilling equipment used during our field exploration.

3.2.6. Groundwater Level Measurements

At the time of drilling, groundwater was not observed in the borings performed during this exploration. However, the moisture conditions of the soil samples were noted and the cave-in depths within each borehole were measured at the time of drilling. Both moisture conditions within the soil and caving soils may be an indication of the presence of groundwater.

It should be noted that groundwater levels tend to fluctuate with seasonal and climatic variations, as well as with some types of construction operations. Therefore, water may be encountered during construction at depths not indicated in the borings performed for this exploration.

3.3. Summary of Laboratory Testing

SUMMIT was on site on December 13th and 14th of 2022 and performed additional geotechnical services that consisted of retrieving soil samples at pre-selected locations. The primary purpose of this exploration was to obtain additional information concerning onsite soils and engineering properties at higher elevations of the site assumed to be potential cut areas; and proposed pond excavations.

Laboratory Testing Services

While on site, **SUMMIT** collected two (2) soil samples from mechanical soil borings B-1 and B-10 at a depth ranging from 3.5 to 5 feet below the existing ground surface. The soil samples were transported to **SUMMIT**'s laboratory for visual examination and laboratory testing. The laboratory testing was performed to better evaluate the onsite soils' USCS soil classification. The laboratory testing performed included two (2) Moisture Content tests (ASTM D 2216), two (2) Atterberg Limit tests (ASTM D 4318), two (2) Sieve Analysis w/o Hydrometer tests (ASTM D 422). The laboratory test results are summarized in the following table and are included in the Appendix 3 of this report.

Summary of Laboratory Testing

Test Pit No.	Sample Depth (feet)	Moisture Content (%)	Soil Class. USCS	Atterberg Limit Test Results		
				Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
B-1	3.5 – 5	26.1	MH	69	37	32
B-10	3.5 – 5	24.2	MH	51	37	14

Based on our laboratory test results, the maximum dry unit weights of the two (2) bulk samples ranged from 83.6 pounds per cubic foot (pcf) to 90.0 pcf. **SUMMIT** recommends that structural fill exhibit a maximum dry unit weight of at least 90 pcf, as determined by a Standard Proctor compaction test (ASTM-D698). Additionally, we recommend that structural fill be compacted to a minimum of 95 percent of the soil's Standard Proctor maximum dry density (ASTM D 698) at/or near optimum moisture content (±2 percent). Based on the laboratory results the tested areas will likely require some reworking in accordance with sections 5.5 and 5.6 of this report for use as structural fill.

4.0 EVALUATIONS AND RECOMMENDATIONS

4.1. General

Our preliminary evaluation and recommendations are based on the project information outlined previously and on the data obtained from the field and laboratory testing program. If the structural loading, geometry, or proposed building locations are changed or significantly differ from those outlined, or if conditions are encountered during construction that differ from those encountered by the borings, **SUMMIT** requests the opportunity to review our recommendations based on the new information and make the necessary changes.

Grading plan information with proposed foundation bearing elevations was not available for our review at the time of this report. Finish grade elevations of proposed construction in conjunction with the proposed foundation bearing elevation can have a significant effect on design and construction considerations. **SUMMIT** should be provided the opportunity to review the project grading plans prior to their finalization with respect to the recommendations contained in this report.

4.2. Shallow Foundation Recommendations

Based on the results of the soil test borings, and our assumptions regarding site grading and assumed structural building loads, the proposed structures can be adequately supported on shallow foundation systems provided site preparation and compacted fill recommendation procedures outlined in this report are implemented concerning unsuitable soils such as existing fill soils and soils with N-values less than 6 bpf. An allowable net bearing pressure of up to 2,000 pounds per square foot (psf) can be used for design of the foundations bearing on approved undisturbed residual soils, or on approved structural fill compacted to at least 95 percent of its Standard Proctor maximum dry density. Please refer to section 5.0 of this report for more information.

Provided the procedures and recommendations outlined in this report are implemented and using the assumed loads, we have estimated a total settlement of less than 1 inch for footing design pressures of 2,000 psf.

To avoid punching type bearing capacity failure, we recommend wall foundation widths of 18 inches or more. Exterior foundations and foundations in unheated areas should be designed to bear at least 12 inches below finished grade for frost protection. To reduce the effects of seasonal moisture variations in the soils, for frost protection and for bearing capacity, it is recommended that all foundations be embedded at least 12 inches below the lowest adjacent grade.

All footing excavations and undercutting remediation operations should be inspected by the Geotechnical Engineer-of-Record or and/or their designee to confirm that suitable soils are present at and below the proposed bearing elevation and that the backfill operations are completed with the recommendations of this report. This evaluation may include hand-auger and DCP testing. If DCP testing encounters lower penetration resistances than anticipated or unsuitable materials are observed beneath the footing excavations, these bearing soils should be corrected per the Geotechnical Engineer-of-Record's recommendations.

4.3. Retaining Wall Recommendations (if used)

Design Parameters for backfill properties (i.e., friction angle, earth pressure coefficients) should use the values in the table below. These parameters are based on suitable soils with a minimum moist unit weight of 120 pcf. **SUMMIT** should be retained to test the actual soils used for construction to verify these design assumptions. To reduce long term creep or deflections to the wall system, desirable wall backfill soils should be used. These include non-plastic, granular soils (sands and gravels). However, these soils may not be available on site.

Soil Parameters for Wall Backfill

Backfill Type	Allowable Bearing Capacity (psf)	Friction Angle (deg)	Modulus of Subgrade Reaction (pci)	Active Earth Pressure Coefficient K_a	Passive Earth Pressure Coefficient Kp	Coefficient of Earth Pressure at Rest Ko	Slide Friction
Residuum	2,000	28°	200	0.361	2.77	0.531	0.4
Fill	2,000	24 °	150	0.421	2.37	0.593	0.4

Additional Testing is Required to verify these estimated designed parameters.

Soils classified as elastic silts (MH) and/or fat clays (CH) shall not be used for wall backfill or in the retained zone as shown in Table 1610.1 of the 2018 IBC. If on-site soils are used as backfill within the reinforced zone, the wall designer should address the need for wall drainage and the possibility of long-term, time-dependent movement or creep in their design.

At the time of report preparation, we were not provided retaining wall plans or specifications. Therefore, we request the opportunity to review the wall plans and specifications once they are finalized and make any necessary changes to our recommendations. Also, we recommend an external stability analysis (including global stability) of the proposed wall(s) be conducted once the site layout and wall geometry is complete.

4.4. Seismic Site Class

SUMMIT has determined the Seismic Site Classification for this project site in accordance with Chapter 20 of ASCE 7, Site Class Definitions using SPT N-Values. We recommend this project be designed using a Seismic Site Class of “E” (Soft soil profile) as defined in ASCE 7 Chapter 20 Table 20.3-1 Site Classification.

4.5. Low to Moderate Plasticity Moisture Sensitive Soils (MH)

Low to moderate plasticity and moisture sensitive elastic silt (MH) soils were encountered in the majority of the borings performed during this exploration. These fine-grained soils are susceptible to moisture intrusion and can become soft when exposed to weather and/or water infiltration. Consequently, some undercutting and/or reworking (drying) of the near-surface soils may be required depending upon the site management practices and weather conditions present during construction.

Should these materials be left in-place, special consideration should be given to providing positive drainage away from the structure and discharging roof drains a minimum of 5 feet from the foundations to reduce infiltration of surface water to the subgrade materials.

Note: Since Low to Moderate Plasticity and Moisture Sensitive Soils can become remolded (i.e., softened) under the weight of repeated construction traffic and changes in moisture conditions, these soils should be evaluated and closely monitored by the Geotechnical Engineer-of-Record or and/or their designee prior to and during fill placement. Additional testing and inspections of moisture sensitive soils may be warranted such as laboratory testing, field density (compaction) testing, hand auger borings with dynamic cone penetrometer (DCP) testing and/or test pit excavations.

4.6. Wet Weather Conditions

Contractors should be made aware of the moisture sensitivity of the near soils and potential compaction difficulties. If construction is undertaken during wet weather conditions, the surficial soils may become saturated, soft, and unworkable. The contractor can anticipate reworking and/or recompacting soils may be needed when excessive moisture conditions occur. Additionally, subgrade stabilization techniques, such as chemical (lime or lime-fly ash) treatment, may be needed to provide a more weather-resistant working surface during construction. Therefore, we recommend that consideration be given to construction during the dryer months.

Surface runoff should be drained away from excavations and not allowed to pond. Concrete for foundations should be placed as soon as practical after the excavation is made. That is, the exposed foundation soils should not be allowed to become excessively dry or wet before placement of concrete. Bearing soils exposed to moisture variations may become highly disturbed resulting in the need for undercutting prior to placement of concrete. If excavations must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, we recommend that a 2- to 4-inch-thick "mud-mat" of lean (2000 psi) concrete be placed on the bearing soils before work stops for the night.

SUMMIT recommends that special care be given to providing adequate drainage away from the building areas to reduce infiltration of surface water to the base course and subgrade materials. If these materials are allowed to become saturated during the life of the slab section, a strength reduction of the materials may result causing a reduced life of the section.

4.7. Floor Slabs

Slab-on-grade floor systems may be supported on approved residual soils, or newly compacted fill, provided the site preparation and fill placement procedures outlined in this report are implemented. Depending upon the amount of cuts and/or fills, unsuitable soils such as existing fill soils and areas which deflect, rut or pump excessively during proof-rolling may require remediation as described in Section 6.2. We recommend non-monolithic floor slabs be isolated from other structural components to allow independent movement of the slab and the building foundation elements.

The proposed slab-on-grade floor slab should be designed to withstand the planned dead and live loads. Based on the use of granular fill material, soils encountered in our borings and our experience, a modulus of subgrade reaction (k) of 125 pci can be used to design the floor slab supported on the subgrade soils. A higher modules value may be available once the structural soils and/or supporting soils has been identified. We recommend a minimum of 4-inch thickness

of crushed stone (SCDOT MACADAM stone gradation or equivalent) compacted to a minimum of 98 percent of the material's Standard Proctor maximum dry density (ASTM D 698) be placed as floor slab base course.

Immediately prior to constructing a floor slab, the areas should be proof-rolled to detect any softened, loosened or disturbed areas that may have been exposed to wet weather or construction traffic. Areas that are found to be disturbed or indicate pumping action during the proof-rolling should be undercut and replaced with adequately compacted structural fill. This proof-rolling should be observed by a **SUMMIT** staff professional or a senior soils technician under his/her direction. Proof-rolling procedures are outlined in the "Site Preparation" section of this report.

4.8. Pavements Subgrade Preparation

The pavement sections can be adequately supported on approved non-high plasticity residual soils, or newly compacted fill, provided the site preparation and fill placement procedures outlined in this report are implemented. Immediately prior to constructing the pavement section, we recommend that the areas be proofrolled to detect any softened, loosened or disturbed areas that may have been exposed to wet weather or construction traffic. Areas that are found to be disturbed or indicate instability during the proofrolling should be undercut and replaced with adequately compacted structural fill or repaired as recommended by the Geotechnical Engineer-of-Record. This proofrolling should be observed by a **SUMMIT** professional or a senior soils technician under his/her direction. Proofrolling procedures are outlined in the "Site Preparation" section of this report.

Based on the results of our pavement borings (P-1 through P-6) the underlying base material should be suitable for reuse of pavement however, due to prevalence of near surface low to moderate plasticity elastic silts (MH), remediation of pavement subgrade soils may be recommended (as determined by the Geotechnical Engineer-of-Record during construction)

including undercutting and replacement with additional SCDOT MACADAM stone. Alternatively, lime stabilization of pavement subgrade may be a more economical option and **SUMMIT** can provide lime stabilization mix design services if requested. This may be more pronounced depending on the time of the year and seasonal conditions at the time of pavement construction. We recommend contingency for some remediation efforts for the subgrade soils be considered during the planning stage.

The following table summarizes the locations and approximate depths of the surficial materials encountered in the roadway borings performed for this exploration.

Summary Table of Existing Surface Materials Depths

Boring No.	Existing Asphalt Approx. Depth, (inches)[1]	Existing Gravel Approx. Depth, (inches)[1]
B-2	4	6
P-1	---	3
P-2	---	5
P-3	---	3
P-4	---	5.5
P-5	6	---
P-6	3	3

4.9. Cut and Fill Slopes

Permanent project slopes should be designed with geometry of 3 horizontal to 1 vertical (3H:1V) or flatter. The tops and bases of all slopes should be located 10 feet or more from structural limits and 5 feet or more from parking limits. Fill slopes should be constructed utilizing properly compacted, structural fill according to the recommendations provided in this report. In addition, fill slopes should be overbuilt and cut to finished grade during construction to achieve proper compaction on the slope face. All slopes should be seeded, stabilized and maintained after construction and adhere to local, state and federal municipal standards, if applicable.

Immediately prior to constructing the project slopes, the areas should be proof-rolled to detect any softened, loosened or disturbed areas that may have been exposed to wet weather or construction traffic. Areas that are found to be disturbed or indicate pumping action during the proof-rolling should be undercut and replaced with adequately compacted structural fill. This proof-rolling should be observed by a **SUMMIT** staff professional or a senior soils technician under his/her direction. Proof-rolling procedures are outlined in the “Site Preparation” section of this report.

Structural fill should not be placed on a subgrade with a slope steeper than 5 horizontal to 1 vertical (5H:1V), unless the fill is confined by an opposing slope, such as in a ravine. Otherwise, where steeper slopes exist, the subgrade should be benched to allow for fill placement on a horizontal surface.

5.0 PAVEMENT RECOMMENDATIONS

Pavement strength is normally calculated and designed based on SCDOT Design Methodology using what is called a Structural Number (SN). A pavements' SN was calculated based on the thickness of an individual pavement component multiplied by the component's Strength Coefficient. The Strength Coefficient is assigned based on empirical information gathered by various highway agencies to include the SCDOT. In general, Strength Coefficient is the highest for hot laid compacted asphalt (0.44 per inch) and lower for graded aggregate base course (0.18 per inch).

The following data was used during our pavement analysis:

- California bearing ratio (CBR) value (estimated): 3 – poor condition elastic and sandy silts
- RV Parking Spaces – 30 Spaces – estimated 30 RVs/day
- 20-year Design Life.

- **CBR AND RECOMMENDED SSV**

Item	Recommended Value
California Bearing Ratio (CBR) (AASHTO T 193) (Estimated)	3
Soil Support Value	3

- Should the anticipated vehicular loading conditions change, **SUMMIT** should be given the opportunity to review our pavement recommendation and to make any necessary changes or revision.

Flexible Pavement Section

- Based on normal vehicle traffic, the estimated California Bearing Ratio (CBR) and Soil Support Value (SSV), and estimated single axle loads (ESALs) based on 30 RV parking spaces with 2 axle vehicles for light duty pavement and 3 axle vehicles for heavy duty

pavement. **SUMMIT** has recommended the following flexible pavement sections for this project.

- **Recommended Asphalt Light and Heavy Duty Pavement Section**

Material	Light Duty Thickness (Inches)	Heavy Duty Thickness (Inches)
Hot Mix Asphalt (HMA) Surface	**1.5**	**2.0**
Hot Mix Asphalt (HMA) Base	**2.0**	**2.0**
Gravel Aggregate Base Course (GABC)	**8**	**8**
TOTAL RECOMMENDED PAVEMENT THICKNESS	**11.5**	**12**

Rigid Duty Pavement Sections

For the Rigid pavement sections, we recommend a rigid pavement section of Flex 550 concrete (4000 psi) consisting of:

Recommended Rigid Heavy Duty Pavement Section

Material	Light Duty Thickness, Inches	Heavy Duty Thickness, Inches
4,000 psi Concrete	**6**	**8**
Crushed Aggregate Base Course (98% compaction)	**---**	**4**

All new pavement components should meet the latest NCDOT requirements (Standard Specifications for Highway Construction, Latest Edition).

6.0 CONSTRUCTION CONSIDERATIONS

6.1. Abandoned Utilities/Structures

SUMMIT recommends that any existing utility lines and foundations be removed from within proposed building and pavement areas. The utility backfill and foundation material should be removed and the subgrade in the excavations should be inspected by a geotechnical professional prior to fill placement. The subgrade inspection should consist of visual observations, probing with a steel rod and/or performing hand auger borings with Dynamic Cone Penetrometer tests to explore their suitability of receiving structural fill. Once the excavations are inspected and approved, they should be backfilled with adequately compacted structural fill. Excavation backfill under proposed new foundations should consist of properly compacted structural fill, crushed stone, flowable fill or lean concrete as approved by the Geotechnical Engineer-of-Record.

6.2. Site Preparation

Based on the results of our borings, and dependent on final grades, the contractor can anticipate that some undercutting and/or foundation extension through existing fill soils and soils with N-values less than 6 bpf may be required prior to building construction and/or fill placement. If these soils are encountered during the grading activities, the extent of the undercut required should be determined in the field by the Geotechnical Engineer-of-Record and/or their designee. Additional testing such as test pit excavations and/or hand auger borings may be required to further explore these soil conditions, depths and locations.

Topsoil, organic laden/stained soils, construction debris and other unsuitable materials should be stripped/removed from the proposed construction limits. Stripping and clearing should extend 10 feet or more beyond the planned construction limits. Upon completion of the stripping operations, we recommend areas planned for support of foundations, floor slabs, parking areas, slope areas and structural fill be proof-rolled with a loaded dump truck or similar pneumatic tired vehicle (minimum loaded weight of 20 tons) under the observations of a staff professional. After

excavation of the site has been completed, the exposed subgrade in cut areas should also be proof-rolled. The proof-rolling procedures should consist of four complete passes of the exposed areas, with two of the passes being in a direction perpendicular to the proceeding ones. Any areas which deflect, rut or pump excessively during proof-rolling or fail to "tighten up" after successive passes should be undercut to suitable soils and replaced with compacted fill.

The extent of any undercut required should be determined in the field by a **SUMMIT** staff professional or engineer while monitoring construction activity. After the proof-rolling operation has been completed and approved, final site grading should proceed immediately. If construction progresses during wet weather, the proof-rolling operation should be repeated after any inclement weather event with at least one pass in each direction immediately prior to placing fill material or aggregate base course stone. If unstable conditions are experienced during this operation, then undercutting or reworking of the unstable soils may be required.

6.3. Difficult Excavation

Based on the results of our soil test borings and dependent on final grades, it appears that the majority of general excavation for footings and utilities will be possible with conventional excavating techniques. We anticipate that the residual soils can be excavated using pans, scrapers, backhoes, and front-end loaders.

Even though Partially Weathered Rock (PWR) and auger refusal conditions were not encountered in any of the borings performed for this exploration, the depth and thickness of partially weathered rock, boulders, and rock lenses or seams can vary dramatically in short distances and between the boring locations; therefore, soft/hard weathered rock, boulders or bedrock may be encountered during construction at locations or depths, between the boring locations, not encountered during this exploration.

The actual rippability of these in-place materials is however, dependent on many factors such as the operator's skill level, equipment, and the techniques used during excavation, degree of weathering within the formation, rock hardness, rock structure (i.e., foliations or bedding), jointing and fracture spacing and necessary size or width of excavation. Rippability of weathered rock is typically more difficult in confined excavations.

6.4. Temporary Excavation Stability

Localized areas of soft or unsuitable soils not detected by our borings, or in unexplored areas, may be encountered once grading operations begin. Vertical cuts in these soils may be unstable and may present a significant hazard because they can fail without warning. Therefore, temporary construction slopes greater than 5 feet in height should not be steeper than two horizontal to one vertical (2H:1V), and excavated material should not be placed within 10 feet of the crest of any excavated slope. In addition, runoff water should be diverted away from the crest of the excavated slopes to prevent erosion and sloughing.

Should excavations extend below final grades, shoring and bracing or flattening (laying back) of the slopes may be required to obtain a safe working environment. Excavation should be sloped or shored in accordance with local, state and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards.

6.5. Structural Fill

Soil to be used as structural fill should be free of organic matter, roots or other deleterious materials. Structural fill should have a plasticity index (PI) less than 25 and a liquid limit (LL) less than 50 or as approved by the Geotechnical Engineer-of-Record. The structural fill should exhibit a maximum dry density of at least 90 pounds per cubic foot, as determined by a Standard Proctor compaction test (ASTM-D 698). Compacted structural fill should consist of materials classified as either CL, ML, SC, SM, SP, SW, GC, GM, GP, or GW per ASTM D-2487 or as approved by the Geotechnical Engineer-of-Record. Off-site borrow soil should also meet these same classification

requirements. Non-organic, low-plasticity on-site soils are expected to meet this criterion. However, successful reuse of the excavated, on-site soils as compacted structural fill will depend on the moisture content of the soils encountered during excavation. We anticipate that scarifying and drying of portions of the on-site soils will be required before the recommended compaction can be achieved. Drying of these soils will likely result in some delay.

All structural fill soils should be placed within the proposed structural pad and extending at least 5 feet beyond the perimeter of the pad and foundation limits. All structural fill soils should be placed in thin (not greater than 8 inches) loose lifts and compacted to a minimum of 95 percent of the soil's Standard Proctor maximum dry density (ASTM D 698) at/or near optimum moisture content (±2 percent). The upper 2 feet of structural fill should be compacted to a minimum of 100 percent of the soil's Standard Proctor maximum dry density (ASTM D 698) at/or near optimum moisture content (±2 percent). Some manipulation of the moisture content (such as wetting, drying) may be required during the filling operation to obtain the required degree of compaction. The manipulation of the moisture content is highly dependent on weather conditions and site drainage conditions. Therefore, the grading contractor should be prepared to both dry and wet the fill materials to obtain the specified compaction during grading. Sufficient density tests should be performed to confirm the required compaction of the fill material.

6.6. Suitability of Excavated Soils for Re-Use

The soils encountered in the borings should be suitable to be used as structural fill material provided the recommendations in this report are implemented. These soils may be utilized as non-structural fill and backfill at landscaped or non-pavement areas of the project. We recommend non-structural fill to be compacted to at least 92 percent of the soil’s Standard Proctor Maximum Dry Density to reduce settlement of the fill soils particularly over utility trenches.

However, if approved by the Geotechnical Engineer-of-Record, high plasticity soils encountered during general site grading can be mixed/blended and/or mixed with lower plasticity soils and used as structural fill. We recommend that mixed soils be used below the top five (5) feet at deeper fill locations and adequate drainage be provided away from structural and pavement areas. The top five (5) feet should consist of materials classified as either CL, ML, SC, SM, SP, SW, GC, GM, GP or GW per ASTM D-2487 or as approved by the Geotechnical Engineer-of-Record. All fill soils should be placed in thin (not greater than 8 inches) loose lifts and compacted to a minimum of 95 percent of the soil's Standard Proctor maximum dry density (ASTM D 698) at near optimum moisture content (±2 percent).

6.7. Engineering Services During Construction

As previously stated, the engineering recommendations provided in this report are based on the project information outlined above and the data obtained from field and laboratory tests. However, unlike other engineering materials like steel and concrete, the extent and properties of geologic materials (soil) vary significantly. Regardless of the thoroughness of a geotechnical engineering exploration, there is always a possibility that conditions between borings will be different from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the subsurface conditions. This report does not reflect variations that may occur between the boring locations. Therefore, conditions on the site may vary between the discrete locations observed at the time of our subsurface exploration.

The nature and extent of variations between the borings may not become evident until construction is underway. To account for this variability, professional observation, testing and monitoring of subsurface conditions during construction should be provided as an extension of our engineering services. These services will help in evaluating the Contractor's conformance with the plans and specifications. Because of our unique position to understand the intent of the geotechnical engineering recommendations, retaining us for these services will also allow us to

provide consistent service through the project construction. Geotechnical engineering construction observations should be performed under the supervision of the Geotechnical Engineer-of-Record from our office who is familiar with the intent of the recommendations presented herein. This observation is recommended to evaluate whether the conditions anticipated in the design actually exist or whether the recommendations presented herein should be modified where necessary. Observation and testing of compacted structural fill and backfill should also be provided by our firm.

7.0 RELIANCE AND QUALIFICATIONS OF REPORT

This geotechnical subsurface exploration has been provided for the sole use of ADC Engineering. This geotechnical subsurface exploration should not be relied upon by other parties without the express written consent of **SUMMIT** and ADC Engineering.

The analyses and recommendations submitted in this report were based, in part, on data obtained from this exploration. If the above-described project conditions are incorrect or changed after the issuing of this report, or subsurface conditions encountered during construction are different from those reported, **SUMMIT** should be notified and these recommendations should be re-evaluated based on the changed conditions to make appropriate revisions. We have prepared this report according to generally accepted geotechnical engineering practices. No warranty, express or implied, is made as to the professional advice included in this report.

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APPENDIX 1 – Figures

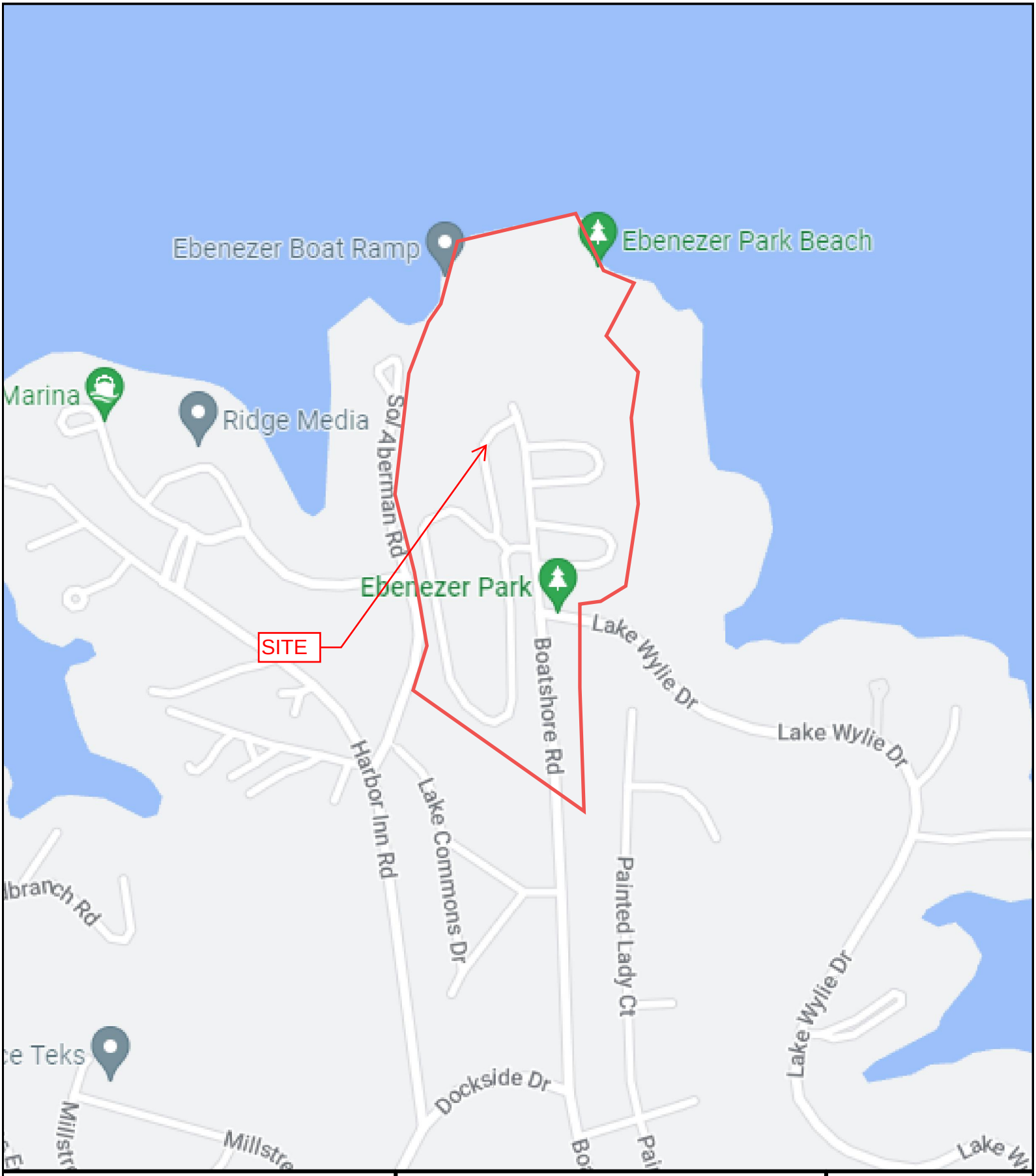

Figure 1
Site Location Plan

SCALE: NTS

Ebenezer Park Phase II Improvements
Boatshore Road
Rock Hill, South Carolina

SUMMIT Project No.: 6752.G0007

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Fort Mill, South Carolina 29715
(803) 504-1717

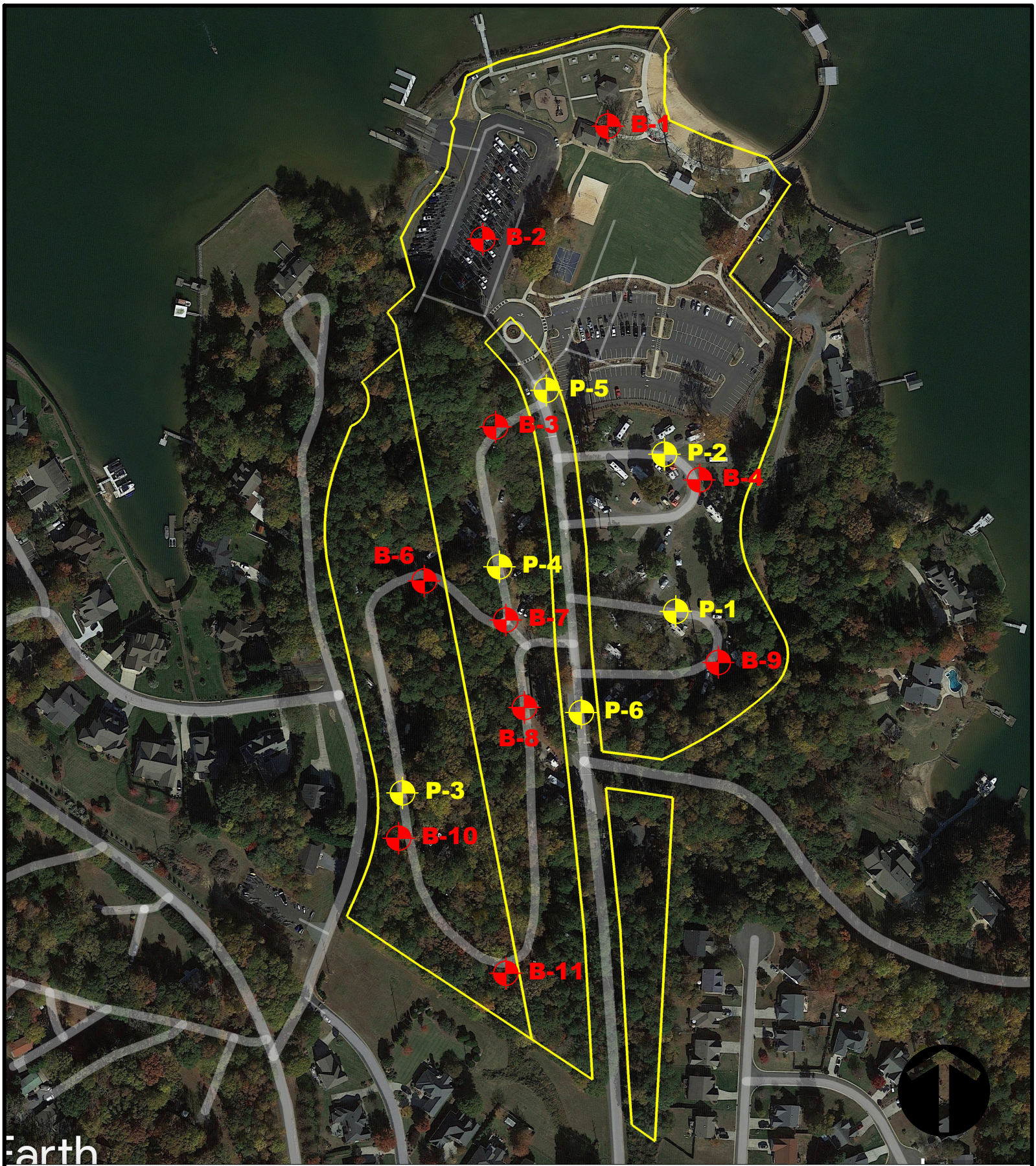

Figure 2
Boring Location Plan

Approx. Soil Test Boring Location

Approx. Pavement Test Boring Location

SCALE: NTS

Ebenezer Park Phase II Improvements
Boatshore Road
Rock Hill, South Carolina

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Fort Mill, South Carolina 29715
(803) 504-1717

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APPENDIX 2 – Boring Logs

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TELEPHONE: 704-504-1717
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KEY TO SYMBOLS

CLIENT ADC
PROJECT NAME Ebenezer Park Phase II
PROJECT NUMBER 6752.G0007
PROJECT LOCATION Rock HIll, South Carolina

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)

- ASPHALT: Asphalt
- BLANK
- FILL: Fill (made ground)
- GW: USCS Well-graded Gravel
- MH: USCS Elastic Silt
- MLS: USCS Sandy Silt
- SM: USCS Silty Sand
- TOPSOIL: Topsoil

SAMPLER SYMBOLS

- Standard Penetration Test

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)
TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION
Water Level at Time Drilling, or as Shown
Water Level at End of Drilling, or as Shown
Water Level After 24 Hours, or as Shown

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3575 Centre Circle
Fort Mill, South Carolina
Telephone: 704-504-1717
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SUBSURFACE DIAGRAM

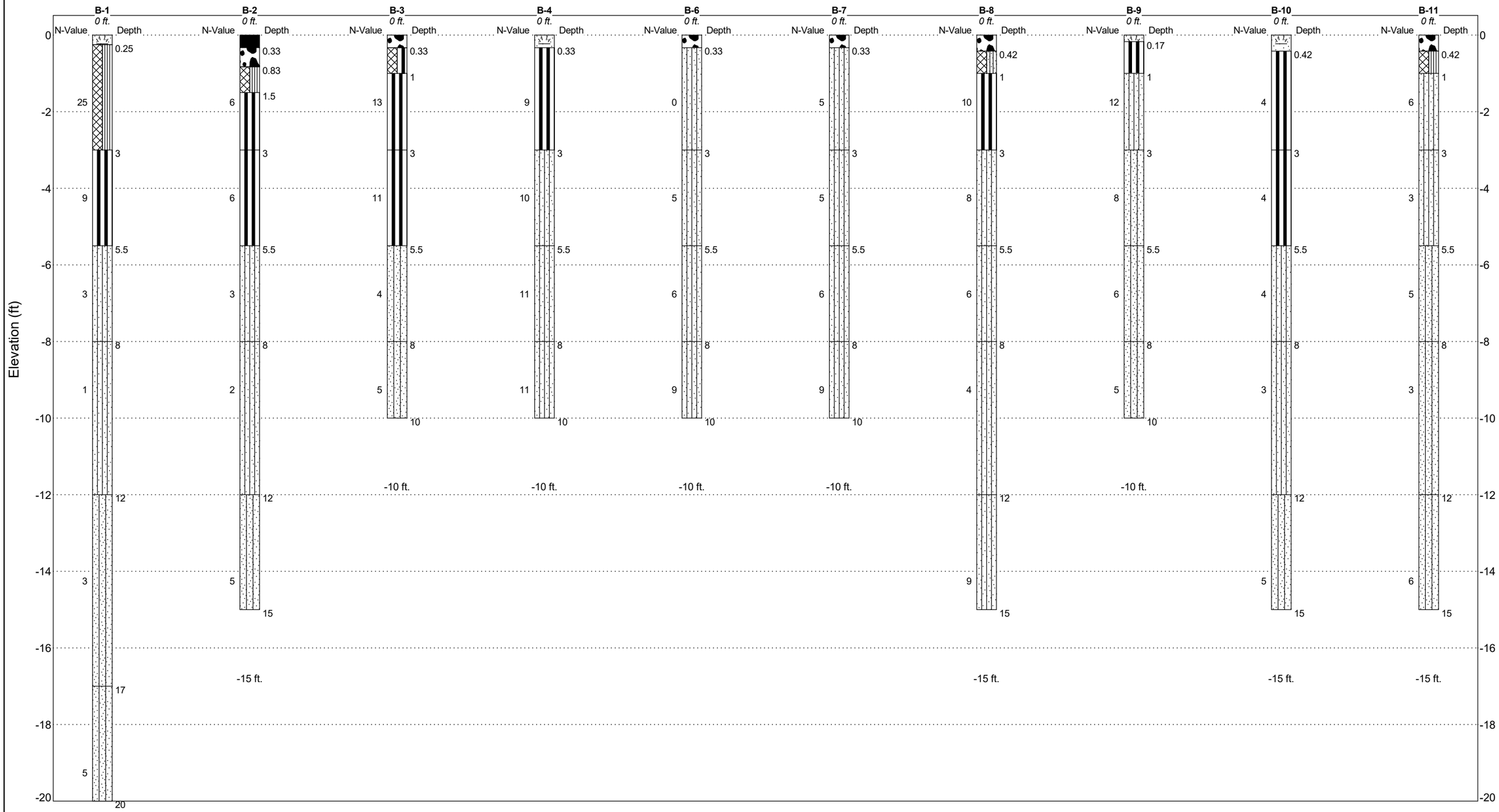
CLIENT ADC

PROJECT NUMBER 6752.G0007

PROJECT NAME Ebenezer Park Phase II

PROJECT LOCATION Rock Hill, South Carolina

Topsoil
USCS Silty Sand
USCS Elastic Silt
Asphalt
USCS Sandy Silt
USCS Well-graded Gravel



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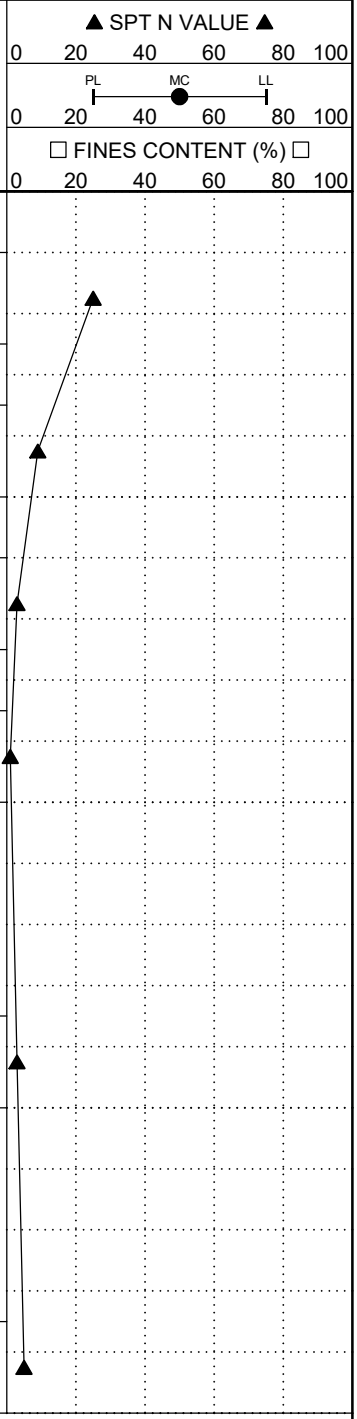
BORING NUMBER B-1

CLIENT ADC
PROJECT NAME Ebenezer Park Phase II
PROJECT NUMBER 6752.G0007
PROJECT LOCATION Rock Hill, South Carolina
DATE STARTED 12/14/22 **COMPLETED** 12/14/22
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR SUMMIT
GROUND WATER/CAVE-IN:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING --- GW 13.5' ATD / Caved in Depth @ 17' bgs
LOGGED BY A. Boer **CHECKED BY** R.Fitzgibbon
AT END OF DRILLING ---
NOTES See Figure 2 "Boring Location Plan" for Approx. Boring Location
AFTER DRILLING ---

ELEVATION (ft.)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Approx. 3" of Topsoil			
		(ML) FILL: Very Stiff Brown, Gray, and Tan Micaceous Sandy SILT	SPT 1		3-13-12 (25)
		(MH) RESIDUUM: Stiff Moist Dark Orange Brown Micaceous Sandy Elastic SILT	SPT 2		4-4-5 (9)
5.0		(ML) Soft Moist Red and Brown Micaceous Slightly Clayey Sandy SILT	SPT 3		2-1-2 (3)
		(ML) Very Soft Very Moist Tan and Brown Micaceous Sandy SILT with Manganese Stains	SPT 4		1-0-1 (1)
10.0		(SM) Very Loose Wet Tan, Brown, and Gray Micaceous Silty SAND with Manganese Stains	SPT 5		1-1-2 (3)
15.0		(SM) Loose Wet Tan, Brown, and Gray Micaceous Silty SAND with Manganese Stains	SPT 6		2-2-3 (5)
20.0		Bottom of Boring at 20 feet bgs, Boring Terminated			



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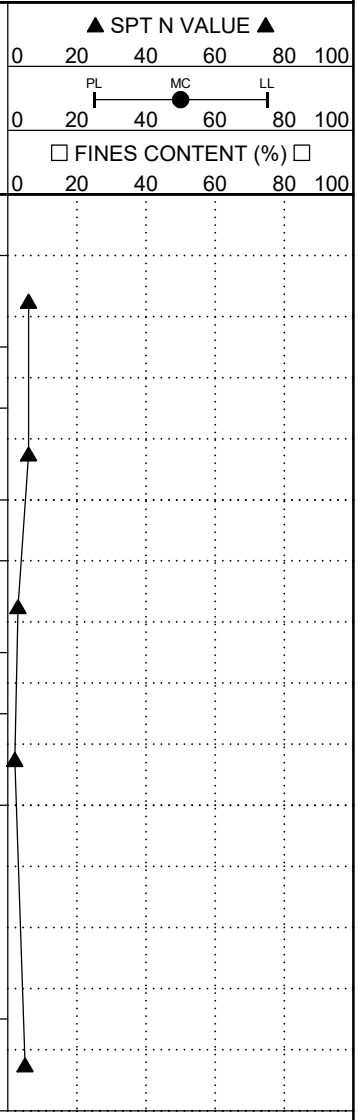
BORING NUMBER B-2

CLIENT ADC
PROJECT NAME Ebenezer Park Phase II
PROJECT NUMBER 6752.G0007
PROJECT LOCATION Rock HIll, South Carolina
DATE STARTED 12/14/22 **COMPLETED** 12/14/22
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR SUMMIT
GROUND WATER/CAVE-IN:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING --- GW NE ATD / Caved in Depth @ 12.5 bgs
LOGGED BY A. Boer **CHECKED BY** R.Fitzgibbon
AT END OF DRILLING ---
NOTES See Figure 2 "Boring Location Plan" for Approx. Boring Location
AFTER DRILLING ---

ELEVATION (ft.)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
	Approx. 4" of Asphalt			
	Approx. 6" of Gravel			
	(ML) FILL: Moist Reddish Brown Slightly Clayey Sandy SILT	SPT 1		3-3-3 (6)
	(MH) RESIDUUM: Firm Moist Brown and Tan Micaceous Sandy Elastic SILT			
	(MH) Firm Moist Red and Brown Micaceous Sandy Elastic SILT	SPT 2		1-3-3 (6)
5.0				
	(ML) Soft Moist Brown and Red Micaceous Slightly Clayey Sandy SILT	SPT 3		2-1-2 (3)
	(ML) Very Soft Moist Brown, Tan, and Red Micaceous Sandy SILT	SPT 4		0-1-1 (2)
10.0				
	(SM) Loose Very Moist Tan and Brown Micaceous Silty SAND with Manganese Stains	SPT 5		2-2-3 (5)
15.0	Bottom of Boring at 15 feet bgs, Boring Terminated			
20.0				



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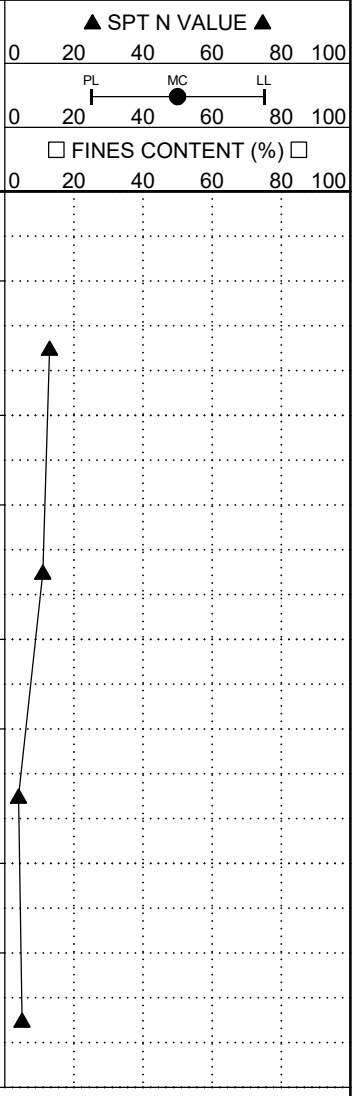
BORING NUMBER B-3

CLIENT ADC
PROJECT NAME Ebenezer Park Phase II
PROJECT NUMBER 6752.G0007
PROJECT LOCATION Rock HIll, South Carolina
DATE STARTED 12/13/22 **COMPLETED** 12/13/22
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR SUMMIT
GROUND WATER/CAVE-IN:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING --- GW NE ATD / Caved in Depth @ 6.9' bgs
LOGGED BY A. Boer **CHECKED BY** R.Fitzgibbon
AT END OF DRILLING ---
NOTES See Figure 2 "Boring Location Plan" for Approx. Boring Location
AFTER DRILLING ---

ELEVATION (ft.)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Approx. 4" of Gravel			
		(MH) FILL: Reddish Brown Sandy Elastic SILT			
		(MH) RESIDUUM: Stiff Brown and Red Micaceous Sandy Elastic SILT	SPT 1		5-7-6 (13)
2.5					
		(MH) Stiff Brown and Red Micaceous Sandy Elastic SILT with Manganese Stains	SPT 2		5-6-5 (11)
5.0					
		(SM) Very Loose Tan and Brown Micaceous Silty SAND	SPT 3		2-2-2 (4)
7.5					
		(SM) Loose Tan and Brown Micaceous Silty SAND with Manganese Stains	SPT 4		3-2-3 (5)
10.0		Bottom of Boring at 10 feet bgs, Boring Terminated			
12.5					
15.0					



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BORING NUMBER B-4

CLIENT ADC
PROJECT NAME Ebenezer Park Phase II
PROJECT NUMBER 6752.G0007
PROJECT LOCATION Rock Hill, South Carolina
DATE STARTED 12/14/22 **COMPLETED** 12/14/22
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR SUMMIT
GROUND WATER/CAVE-IN:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING --- GW NE ATD / Caved in Depth @ 7' bgs
LOGGED BY A. Boer **CHECKED BY** R.Fitzgibbon
AT END OF DRILLING ---
NOTES See Figure 2 "Boring Location Plan" for Approx. Boring Location
AFTER DRILLING ---

ELEVATION (ft.)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Approx. 4" of Topsoil			
		(MH) RESIDUUM: Stiff Moist Red and Brown Micaceous Sandy Elastic SILT	SPT 1		5-4-5 (9)
2.5		(ML) Stiff Moist Red and Brown Micaceous Slightly Clayey Sandy SILT	SPT 2		11-5-5 (10)
5.0		(ML) Stiff Red and Brown Micaceous Sandy SILT with Manganese Stains	SPT 3		5-5-6 (11)
7.5		(ML) Stiff Tan and Brown Micaceous Sandy SILT with Manganese Stains	SPT 4		4-5-6 (11)
10.0		Bottom of Boring at 10 feet bgs, Boring Terminated			
12.5					
15.0					

▲ SPT N VALUE ▲
0 20 40 60 80 100
PL MC LL
0 20 40 60 80 100
☐ FINES CONTENT (%) ☐
0 20 40 60 80 100

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TELEPHONE: 704-504-1717
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BORING NUMBER B-6

CLIENT ADC
PROJECT NAME Ebenezer Park Phase II
PROJECT NUMBER 6752.G0007
PROJECT LOCATION Rock Hill, South Carolina
DATE STARTED 12/13/22 **COMPLETED** 12/13/22
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR SUMMIT
GROUND WATER/CAVE-IN:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING --- GW NE ATD / Caved in Depth @ 6.6' bgs
LOGGED BY A. Boer **CHECKED BY** R.Fitzgibbon
AT END OF DRILLING ---
NOTES See Figure 2 "Boring Location Plan" for Approx. Boring Location
AFTER DRILLING ---

ELEVATION (ft.)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲ 0 20 40 60 80 100
		Approx. 4" of Gravel				
		(ML) RESIDUUM: Very Soft Moist Brown and Red Slightly Clayey Sandy SILT	SPT 1		0-0-0 (0)	
2.5		(ML) Firm Moist Brown, Tan, and Red Slightly Clayey Sandy SILT	SPT 2		2-3-2 (5)	
5.0		(ML) Firm Moist Red, Brown, and Tan Micaceous Sandy SILT	SPT 3		3-3-3 (6)	
7.5		(ML) Stiff Moist Red, Brown and Tan Micaceous Sandy SILT with Manganese Stains	SPT 4		5-4-5 (9)	
10.0		Bottom of Boring at 10 feet bgs, Boring Terminated				
12.5						
15.0						

PL MC LL
0 20 40 60 80 100
☐ FINES CONTENT (%) ☐
0 20 40 60 80 100

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BORING NUMBER B-7

CLIENT ADC
PROJECT NAME Ebenezer Park Phase II
PROJECT NUMBER 6752.G0007
PROJECT LOCATION Rock Hill, South Carolina
DATE STARTED 12/13/22 **COMPLETED** 12/13/22
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR SUMMIT
GROUND WATER/CAVE-IN:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING --- GW NE ATD / Caved in Depth @ 7' bgs
LOGGED BY A. Boer **CHECKED BY** Z. Rodriguez
AT END OF DRILLING ---
NOTES See Figure 2 "Boring Location Plan" for Approx. Boring Location
AFTER DRILLING ---

ELEVATION (ft.)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Approx. 4" of Gravel			
		(ML) RESIDUUM: Firm Tan and Brown Sandy SILT	SPT 1		5-3-2 (5)
2.5		(ML) Firm Tan and Brown Sandy SILT with Manganese Stains	SPT 2		2-3-2 (5)
5.0		(ML) Firm Tan and Gray Sandy SILT	SPT 3		3-3-3 (6)
7.5		(ML) Stiff Tan, Gray, and White Micaceous Sandy SILT	SPT 4		5-4-5 (9)
10.0		Bottom of Boring at 10 feet bgs, Boring Terminated			
12.5					
15.0					

▲ SPT N VALUE ▲
0 20 40 60 80 100
PL MC LL
0 20 40 60 80 100
☐ FINES CONTENT (%) ☐
0 20 40 60 80 100

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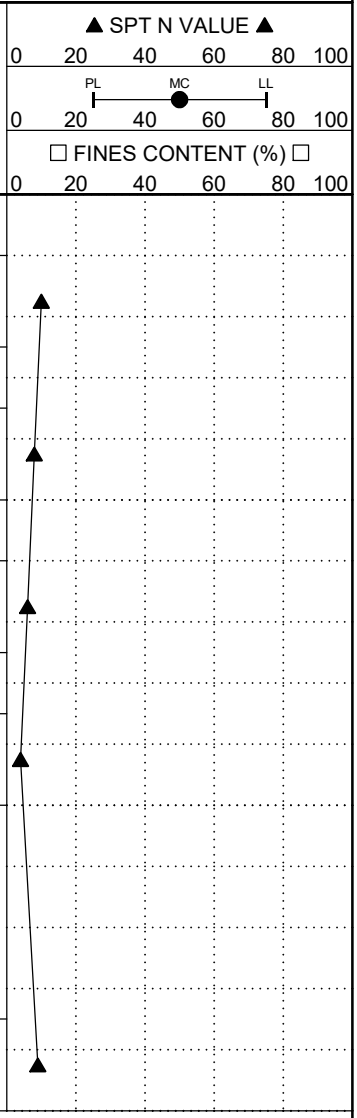
BORING NUMBER B-8

CLIENT ADC
PROJECT NAME Ebenezer Park Phase II
PROJECT NUMBER 6752.G0007
PROJECT LOCATION Rock Hill, South Carolina
DATE STARTED 12/13/22 **COMPLETED** 12/13/22
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR SUMMIT
GROUND WATER/CAVE-IN:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING --- GW NE ATD / Caved in Depth @ 10' bgs
LOGGED BY A. Boer **CHECKED BY** Z. Rodriguez
AT END OF DRILLING ---
NOTES See Figure 2 "Boring Location Plan" for Approx. Boring Location
AFTER DRILLING ---

ELEVATION (ft.)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Approx. 5" of Gravel			
		(SM) FILL: Brown and Gray Silty SAND with Gravel			
		(MH) RESIDUUM: Stiff Red and Tan Micaceous Sandy Elastic SILT	SPT 1		5-5-5 (10)
		(ML) Firm Red and Tan Micaceous Sandy SILT	SPT 2		4-4-4 (8)
5.0		(ML) Firm Tan, Light Reddish Brown, and Gray Micaceous Sandy SILT	SPT 3		2-3-3 (6)
		(ML) Soft Tan, Light Reddish Brown, and Gray Micaceous Sandy SILT	SPT 4		2-2-2 (4)
10.0		(ML) Stiff Tan, Light Gray, and White Micaceous Sandy SILT with Manganese Stains	SPT 5		3-4-5 (9)
15.0		Bottom of Boring at 15 feet bgs, Boring Terminated			
20.0					



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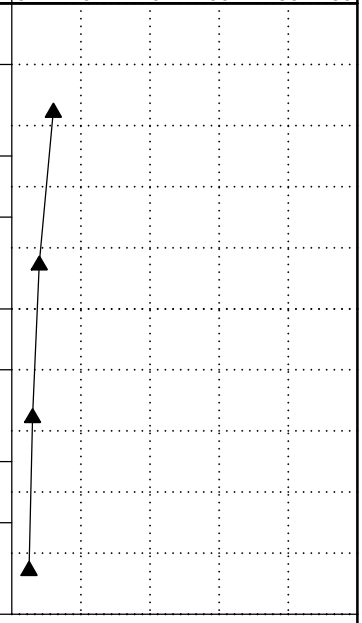
BORING NUMBER B-9

CLIENT ADC
PROJECT NAME Ebenezer Park Phase II
PROJECT NUMBER 6752.G0007
PROJECT LOCATION Rock HIll, South Carolina
DATE STARTED 12/14/22 **COMPLETED** 12/14/22
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR SUMMIT
GROUND WATER/CAVE-IN:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING --- GW NE ATD / Caved in Depth @ 10' bgs
LOGGED BY A. Boer **CHECKED BY** Z. Rodriguez
AT END OF DRILLING ---
NOTES See Figure 2 "Boring Location Plan" for Approx. Boring Location
AFTER DRILLING ---

ELEVATION (ft.)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Approx. 2" of Topsoil			
		(MH) RESIDUUM: Reddish Brown Sandy Elastic SILT			
		(ML) Stiff Reddish Brown and Brown Micaceous Slightly Clayey Sandy SILT	SPT 1		6-5-7 (12)
		(SM) Loose Brown and Gray Micaceous Silty SAND	SPT 2		8-3-5 (8)
5.0		(SM) Loose Light Reddish Brown and Tan Micaceous Silty SAND	SPT 3		3-3-3 (6)
		(SM) Loose Tan, Gray, and White Silty SAND	SPT 4		3-2-3 (5)
10.0		Bottom of Boring at 10 feet bgs, Boring Terminated			
15.0					
20.0					

▲ SPT N VALUE ▲
0 20 40 60 80 100
PL MC LL
0 20 40 60 80 100
☐ FINES CONTENT (%) ☐
0 20 40 60 80 100



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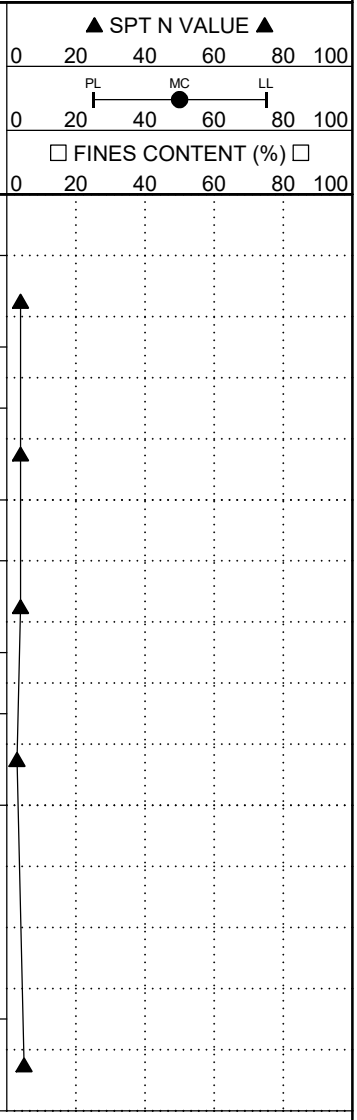
BORING NUMBER B-10

CLIENT ADC
PROJECT NAME Ebenezer Park Phase II
PROJECT NUMBER 6752.G0007
PROJECT LOCATION Rock Hill, South Carolina
DATE STARTED 12/13/22 **COMPLETED** 12/13/22
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR SUMMIT
GROUND WATER/CAVE-IN:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING --- GW NE ATD / Caved in Depth @ 9.6' bgs
LOGGED BY A. Boer **CHECKED BY** Z. Rodriguez
AT END OF DRILLING ---
NOTES See Figure 2 "Boring Location Plan" for Approx. Boring Location
AFTER DRILLING ---

ELEVATION (ft.)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Approx. 4" of Topsoil			
		(MH) RESIDUUM: Soft Moist Reddish Brown Micaceous Sandy Elastic SILT	SPT 1		2-2-2 (4)
5.0		(MH) Soft Moist Orange Brown Micaceous Sandy Elastic SILT	SPT 2		2-2-2 (4)
		(ML) Soft Moist Reddish Brown Micaceous Sandy SILT	SPT 3		1-2-2 (4)
10.0		(ML) Soft Moist Reddish Brown, Light Reddish Brown, and Gray Micaceous Sandy SILT	SPT 4		1-1-2 (3)
15.0		(SM) Loose Tan, Gray, and Light Reddish Brown Micaceous Silty SAND	SPT 5		4-3-2 (5)
20.0		Bottom of Boring at 15 feet bgs, Boring Terminated			



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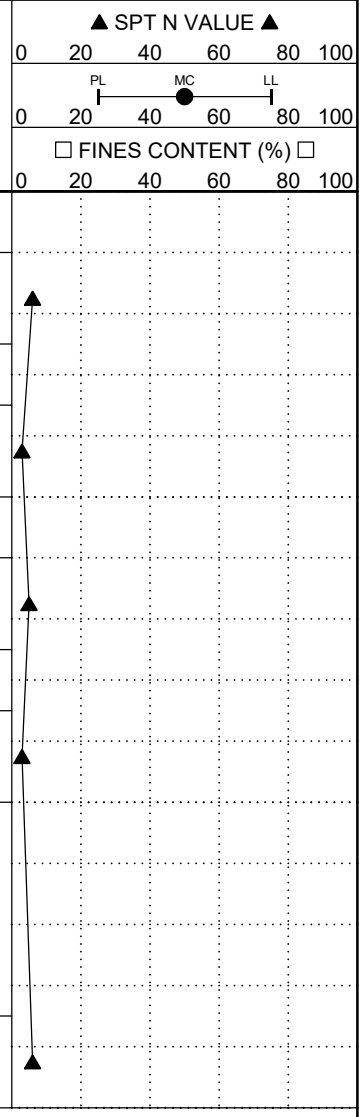
BORING NUMBER B-11

CLIENT ADC
PROJECT NAME Ebenezer Park Phase II
PROJECT NUMBER 6752.G0007
PROJECT LOCATION Rock Hill, South Carolina
DATE STARTED 12/13/22 **COMPLETED** 12/13/22
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR SUMMIT
GROUND WATER/CAVE-IN:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING --- GW NE ATD / Caved in Depth @ 10' bgs
LOGGED BY A. Boer **CHECKED BY** Z. Rodriguez
AT END OF DRILLING ---
NOTES See Figure 2 "Boring Location Plan" for Approx. Boring Location
AFTER DRILLING ---

ELEVATION (ft.)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
	Approx. 5" of Gravel			
	(ML) FILL: Reddish Brown Slightly Clayey Sandy SILT			
	(ML) RESIDUUM: Firm Reddish Brown Micaceous Slightly Clayey Sandy SILT	SPT 1		5-3-3 (6)
	(ML) Soft Reddish Brown Micaceous Sandy SILT	SPT 2		1-1-2 (3)
5.0	(SM) Loose Brown and Tan Micaceous Silty SAND	SPT 3		2-3-2 (5)
	(SM) Very Loose Tan and Gray Micaceous Silty SAND	SPT 4		2-1-2 (3)
10.0	(SM) Loose Tan, Gray, and White Micaceous Silty SAND	SPT 5		3-2-4 (6)
15.0	Bottom of Boring at 15 feet bgs, Boring Terminated			
20.0				



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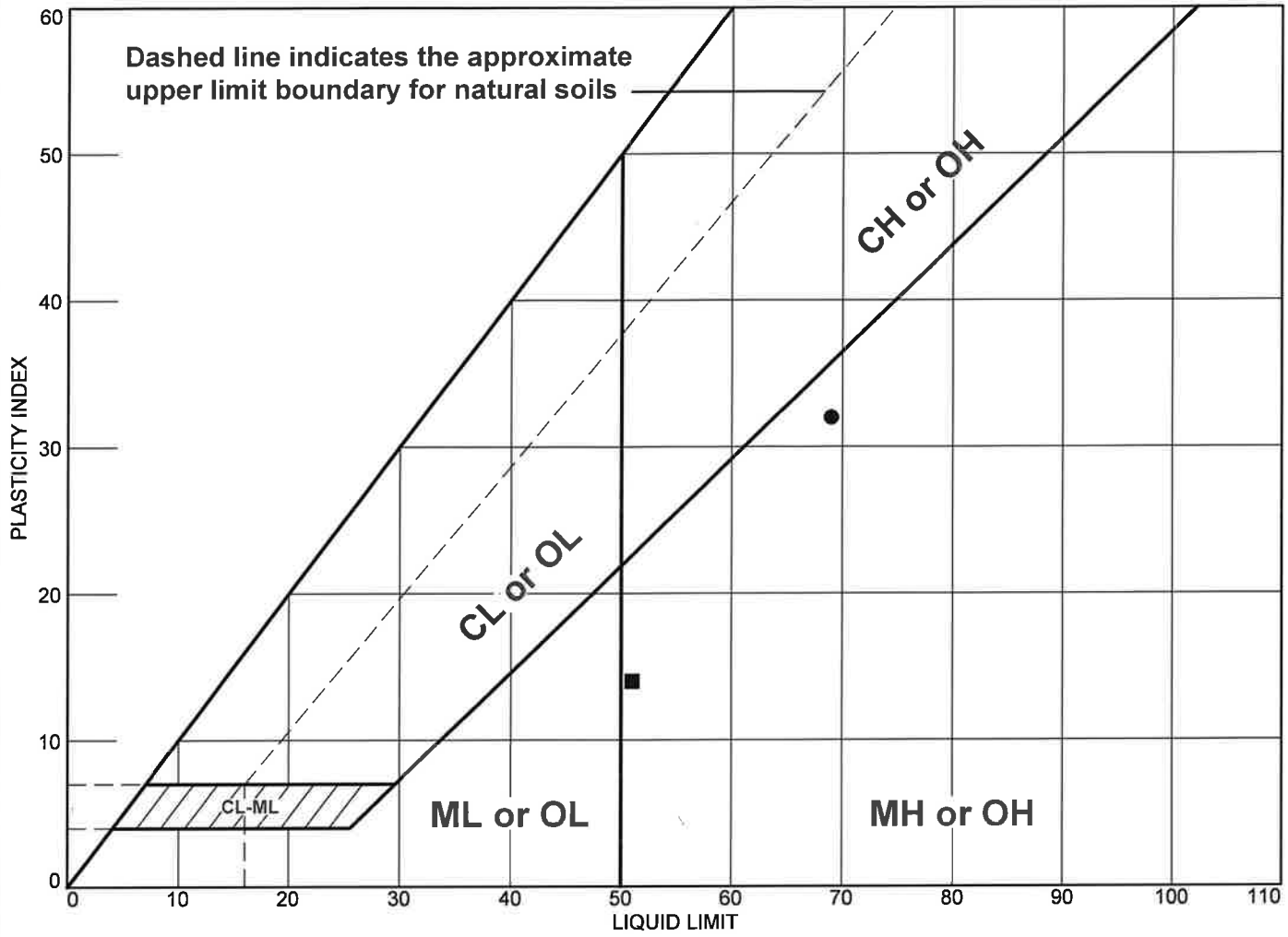
APPENDIX 3 – Laboratory Testing Results

LIQUID AND PLASTIC LIMITS TEST REPORT, ASTM D 4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark Orange-Brown Sandy Elastic Silt	69	37	32	85.1	66.2	MH
■	Orange-Brown Micaceous Sandy Elastic Silt	51	37	14	75.7	53.0	MH

Project No. 6752.G0007 **Client:** ADC Engineering

Project: Ebenezer Park

● **Location:** B-1 SS @ 3.5'-5'

■ **Location:** B-10 SS @ 3.5'-5'

Remarks:

● Moisture Content: 26.1%

■ Moisture Content: 24.2%

Summit Engineering

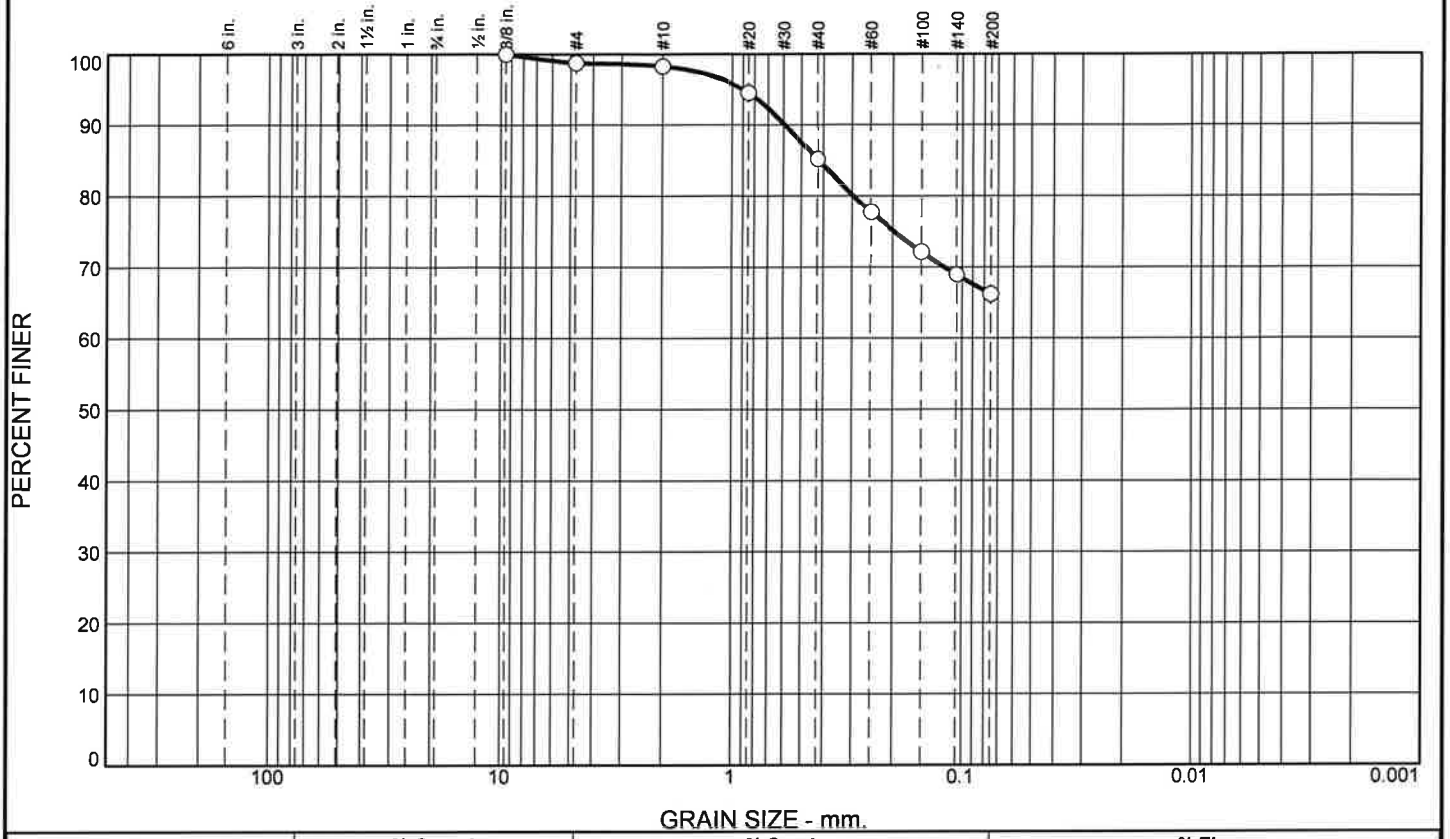
Ft. Mill, South Carolina

Figure

Tested By: FG **Checked By:** MH

Particle Size Distribution Report

ASTM D6913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.2	0.5	13.2	18.9	66.2	

Test Results (ASTM D6913)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
0.375	100.0			
#4	98.8			
#10	98.3			
#20	94.5			
#40	85.1			
#60	77.7			
#100	72.2			
#140	68.9			
#200	66.2			

* (no specification provided)

Material Description

Dark Orange-Brown Sandy Elastic Silt

Atterberg Limits

PL= 37 LL= 69 PI= 32

Coefficients

D_{90}= 0.5919 D_{85}= 0.4218 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(22)

Test Remarks

Location: B-1 SS @ 3.5'-5'

Sample Date: 01-02-23

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Ft. Mill, South Carolina

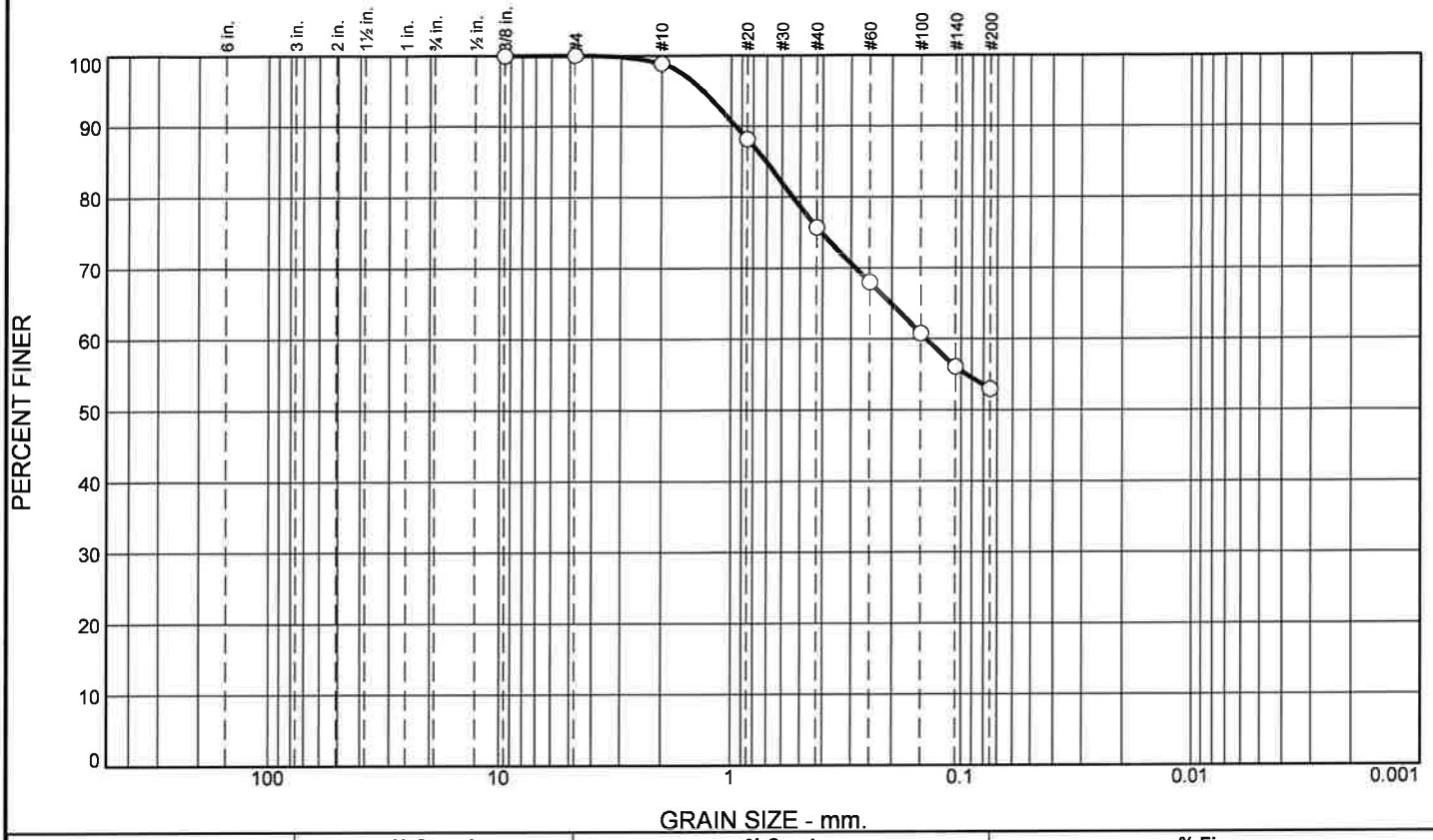
Client: ADC Engineering
Project: Ebenezer Park

Project No: 6752.G0007 **Figure**

Tested By: FG **Checked By:** MH

Particle Size Distribution Report

ASTM D6913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.2	23.1	22.7	53.0	

Test Results (ASTM D6913)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
0.375	100.0			
#4	100.0			
#10	98.8			
#20	88.2			
#40	75.7			
#60	68.0			
#100	60.8			
#140	56.1			
#200	53.0			

* (no specification provided)

Material Description

Orange-Brown Micaceous Sandy Elastic Silt

Atterberg Limits

PL= 37 LL= 51 PI= 14

Coefficients

D_{90}= 0.9574 D_{85}= 0.7049 D_{60}= 0.1420
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(6)

Test Remarks

Location: B-10 SS @ 3.5'-5'

Sample Date: 01-02-23

Summit Engineering

Ft. Mill, South Carolina

Client: ADC Engineering
Project: Ebenezer Park
Project No: 6752.G0007

Figure

Tested By: FG **Checked By:** MH

ASBESTOS AND LEAD PAINT SURVEY

EBENEZER PARK

4490 BOATSHORE ROAD
ROCK HILL, SOUTH CAROLINA 29732

ECS PROJECT NO. 49:20058

FOR: ADC ENGINEERING

APRIL 25, 2023

April 25, 2023

Mr. Fred Guthier
ADC Engineering
25 Woods Lake Road
Suite 210
Greenville, South Carolina 29607
fredg@adcengineering.com

ECS Project No. 49:20058

Reference: Asbestos and Lead Paint Survey, Ebenezer Park, 4490 Boatshore Road, Rock Hill, South Carolina

Dear Mr. Guthier:

ECS Southeast, LLP (ECS) is pleased to provide ADC Engineering with the results of the above referenced Asbestos and Lead Paint Survey performed at Ebenezer Park located at 4490 Boatshore Road in Rock Hill, South Carolina. This report summarizes our observations, analytical results, findings, and recommendations related to the work performed. The work described in this report was performed by ECS in general accordance with the Scope of Services described in ECS Proposal Number 49:36667P and the terms and conditions of the agreement authorizing those services.

ECS appreciates this opportunity to provide ADC Engineering with our services. If we can be of further assistance to you, please do not hesitate to contact us.

Sincerely,

ECS Southeast, LLP

Alex Sayre, CIEC
Environmental Senior Project Manager
asayre@ecslimited.com
704-525-5152

Lindsey Thompson, REM
Environmental Principal
lthompson@ecslimited.com
864-345-0809

EXECUTIVE SUMMARY

ECS understands the subject property is located at 4490 Boatshore Road in Rock Hill, South Carolina. The property and is improved with Ebenezer Park, a campground, park and boat launch. According to information provided by the client, the project scope of work includes two bathroom structures and one concession stand which are planned for upcoming renovation. As part of this renovation, asbestos and lead paint testing has been requested.

The non-destructive asbestos survey was performed on April 7, 2023, by Mr. Alex Sayre an asbestos inspector who has received EPA accredited training and is licensed by South Carolina (BI-01337). CEI submitted a signed final laboratory report to ECS on April 20, 2023. In total, 23 bulk samples from eight homogeneous areas were submitted to the laboratory of which 23 layers were analyzed. None of the bulk samples submitted to CEI were reported to contain detectable concentrations of asbestos. If additional suspect asbestos-containing materials are uncovered which were not accessible during this sampling event, it is recommended that these materials be sampled or tested immediately upon discovery for asbestos content by an asbestos inspector in accordance with 29 CFR 1926.1101.

The Lead-Based Paint (LBP) survey was performed by collection of suspect paint chip samples to identify lead concentrations in painted and glazed surfaces. A total of four samples were collected during the survey, no samples were found to contain greater than 0.5% by weight and defined as lead based paint. Based on the findings of the lead survey, detectable concentrations of lead were identified on one sample, located in white paint on masonry block in the concession stand.

The executive summary is an integral portion of this report, however, ECS recommends the report be read in its entirety.

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TABLE OF APPENDICES

1.0 SITE DESCRIPTION

ECS understands the subject property is located at 4490 Boatshore Road in Rock Hill, South Carolina. The property and is improved with Ebenezer Park, a campground, park and boat launch. According to information provided by the client, the project scope of work includes two bathroom structures and one concession stand which are planned for upcoming renovation. As part of this renovation, asbestos and lead paint testing has been requested.

2.0 PURPOSE

The purpose of the Asbestos and Lead Paint Survey was to identify asbestos-containing materials (ACMs) and lead-based paint (LBP) which may require special handling and/or disposal if removed during construction activities. The identification of ACMs may require trained labor, regulated work practices, and special disposal. The identification of LBP or other lead hazards may require disclosure to contractors and monitoring of lead exposure.

3.0 METHODOLOGY

ECS performed the authorized Scope of Services in general accordance with our proposal, standard industry practice(s) and methods specified by regulation(s) for the identification of ACMs and LBPs.

3.1 Asbestos-Containing Materials

The non-destructive asbestos survey was performed on April 7, 2023, by Mr. Alex Sayre an asbestos inspector who has received EPA accredited training and is licensed by South Carolina (BI-01337). Samples of suspect ACMs were collected utilizing hand tools and placed into individual, labeled plastic bags. Unique bulk suspect ACM samples were submitted to CEI in Fort Mill, South Carolina for analysis via Polarized Light Microscopy (PLM) in accordance with current EPA-600 methodology. Materials consisting of additional layers were analyzed separately. CEI is listed as an accredited laboratory by the National Voluntary Laboratory Accreditation Plan (NVLAP) managed by the National Institute of Standards and Technology (NIST) for bulk sample analysis by currently approved EPA methodology by PLM.

During the survey, ECS attempted to identify suspect ACMs in readily accessible areas. However, due to the destructive means required to identify some materials, certain areas were deemed inaccessible (i.e. behind walls or sub grade materials) and were not surveyed for suspect ACMs. Unidentified suspect ACMs may be located in these and/or other inaccessible areas.

Samples were collected in general accordance with EPA Standard 40 CFR 763 Subpart E, Asbestos Hazard Emergency Response Act (AHERA) and OSHA Standard 29 CFR 1926.1101 Inspection Protocol. Multiple samples of each unique material were submitted. Samples were analyzed using “Positive Stop” methodology. If one sample of a homogeneous material is reported to contain asbestos, the remaining samples of that material are not analyzed. EPA regulations stipulate that if one sample contains asbestos the entire quantity of that material contains asbestos, regardless of additional analysis.

3.2 Lead in Paint and Surface Coatings

The LBP survey was performed by collection of suspect paint chip samples to identify lead concentrations in painted and glazed surfaces.

The survey was conducted utilizing the U.S. EPA definition of LBP. Under this definition, painted surfaces which contain lead in concentrations equal to or greater than 0.5% lead by weight are classified as coated with LBP. Paints with concentrations of lead detectable by the laboratory analysis are considered lead-containing paints. Additionally, fixtures or components that are manufactured with a factory applied glazing (i.e., sinks, toilets, ceramic tiles, etc.) are tested as these factory-applied finishes often contain lead. Activities which disturb lead-containing paints and glazing (while not lead-based paints by the U.S. EPA definition) are regulated by OSHA (29 CFR 1926.62).

4.0 RESULTS

The following is a summary of laboratory results, findings and observations.

4.1 Asbestos-Containing Materials

An Asbestos-Containing Material (ACM) is defined as any material containing more than one percent (>1%) asbestos as determined using the method specified in Appendix E, Subpart E, 40 CFR Part 763, Section 1, PLM. Materials are categorized by the U.S. EPA in the following categories:

- Friable ACMs are defined as any ACM that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. Non-friable ACMs are defined as any ACM that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.
- Category I non-friable ACM are listed as following: packings, gaskets, resilient floor coverings, and asphalt roofing products containing more than one percent (>1%) asbestos.
- Category II non-friable ACM are listed as any material, excluding Category I non-friable ACM, containing more than one percent (>1%) asbestos.

Regulated Asbestos Containing Materials (RACM) are friable ACM or non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading or has crumbled, been pulverized, or reduced to powder in the course of renovation and/or demolition operations.

CEI submitted a signed final laboratory report to ECS on April 20, 2023. In total, 23 bulk samples from eight homogeneous areas were submitted to the laboratory of which 23 layers were analyzed. None of the bulk samples submitted for analysis by PLM or TEM were reported to contain asbestos in detectable concentrations. These materials are summarized below. A complete list of the sampled materials submitted for analysis and sample locations are located in the Appendix of this report. Additional details regarding the overall locations of the materials identified are provided further in the report. Photographs of collected samples are also located in the Appendix of this report.

Summary of Suspect Asbestos Sample Analysis

Sample ID	Location	Material Description	Analytical Results	Category	Estimated Quantity
01-01,02,03	Camp Bathroom Roof	Asphalt shingle and felt	No Asbestos Detected (NAD) by PLM or TEM	Not applicable (N/A)	2,500 SF
02-01,02,03, 04,05	Camp Bathroom Masonry block	Block fill	NAD by PLM	N/A	3,500 SF
03-01,02,03	Lake Bathroom Roof	Asphalt shingle and felt	NAD by PLM or TEM	N/A	1,250 SF
04-01,02,03	Lake Bathroom Masonry block	Block fill	NAD by PLM	N/A	800 SF
05-01,02,03	Lake Concessions Roof	Asphalt shingle and felt	NAD by PLM or TEM	N/A	380 SF
06-01,02,03	Camp Bathroom Janitorial room	Drywall and joint compound	NAD by PLM	N/A	850 SF
07-01,02,03	Concession Masonry block	Block fill	NAD by PLM	N/A	800 SF
08-01,02,03	Concession ceiling	Drywall and joint compound	NAD by PLM	N/A	150 SF

4.2 Suspect or Assumed Asbestos-Containing Materials

Due to the inaccessibility or the destructive means that asbestos sampling requires, additional suspect ACMs may remain within the building hidden behind inaccessible areas that include, but are not limited to, sub-grade walls, structural members, topping slabs, sub-grade sealants, flooring located below underlayments, areas behind exterior walls, pipe trenches, and subsurface utilities, etc. These areas were deemed inaccessible and were not assessed.

If these materials are discovered during construction activities, they should be presumed to contain asbestos and be treated as ACMs or be sampled immediately upon discovery and prior to disturbance for asbestos content by a certified asbestos inspector in accordance with 29 CFR 1926.1101.

4.3 Lead in Paint and Surface Coatings

Paint and surface coatings which contain detectable concentrations of lead considered "lead-containing paints". Since OSHA has no specific action level for lead in paint, all paint on the site found to have a measurable concentration of lead should be assumed to be lead containing. Work performed which may disturb lead-containing paint is regulated under OSHA as referenced under 29 CFR 1926.62. A total of four samples were collected during the survey, no samples were found to contain greater than 0.5% by weight and defined as lead based paint. One sample was detected to contain lead. Paint and other surface coatings which are defined by applicable regulation as lead-based paints are summarized in the table below and photographs of lead-based paint identified are located in the Appendix.

Summary of Lead Paint Chip Analysis Results and Condition

Sample ID	Location	Color	Substrate	Condition	% Lead by Weight
L-1	Camp Bathroom	Beige	Block	Good	<0.0046
L-2	Camp Bathroom	Teal	Block	Good	<0.0045
L-3	Lake Bathroom	Beige	Block	Good	<0.0050
L-4	Lake Concession	White	Block	Good	0.0056

5.0 RECOMMENDATIONS AND REGULATORY REQUIREMENTS

Based on our understanding of the purpose of the Asbestos and Lead Paint Survey, the results of laboratory analysis, and our findings and observations, ECS presents the following recommendations.

5.1 Asbestos-Containing Materials

None of the bulk samples submitted to CEI were reported to contain detectable concentrations of asbestos. If additional suspect asbestos-containing materials are uncovered which were not accessible during this sampling event, it is recommended that these materials be sampled or tested immediately upon discovery for asbestos content by an asbestos inspector in accordance with 29 CFR 1926.1101.

5.2 Lead in Paint and Surface Coatings

Based on the findings of the lead survey, detectable concentrations of lead were identified on some paints and surface coatings.

The presence of lead is a concern primarily when conditions exist where it may be inhaled or ingested. Regardless of the analytical results of a material, all painted and/or glazed surfaces may still contain concentrations of lead in the paint, which when disturbed, may generate lead dust greater than the Permissible Exposure Limit (PEL) of 50 micrograms per cubic meter (ug/m3) as an 8-hour Time Weighted Average (TWA) established by the OSHA "Lead Exposure in Construction Rule (29 CFR 1926.62)."

The OSHA standard gives no guidance on acceptable levels of lead in paint at which no exposure to airborne lead (above the action level) would be expected. Rather, OSHA defines airborne concentrations, and references specific types of work practices and operations from which a lead hazard may be generated (reference 29 CFR 1926.62, section d). Environmental and personnel monitoring should be conducted during any removal/demolition process (as appropriate) to verify that actual personal exposures are below the Permissible Exposure Limit (PEL) of 50 micrograms per cubic meter ($\mu g/m^3$) as an 8-hour Time Weighted Average (TWA). Under OSHA requirements, the contractor performing renovation work will be required to conduct this monitoring and follow applicable requirements under 29 CFR 1926.62 if disturbing lead-containing paint.

6.0 LIMITATIONS

The conclusions and recommendations presented within this report are based upon a reasonable level of assessment within normal bounds and standards of professional practice for a site in this particular geographic setting. ECS is not responsible or liable for the discovery and elimination of hazards that may potentially cause damage, accidents, or injuries.

The observations, conclusions, and recommendations pertaining to environmental conditions at the subject site are necessarily limited to conditions observed, and/or materials reviewed at the time this study was undertaken. No warranty, expressed or implied, is made with regard to the conclusions and recommendations presented within this report. This report is provided for the exclusive use of the client. This report is not intended to be used or relied upon in connection with other projects or by other unidentified third parties without the written consent of ECS and the client.

Our recommendations are in part based on federal, state, and local regulations and guidelines. ECS does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state, or federal public agencies, any conditions at the site that may present a potential danger to public health, safety, or the environment. Under this scope of services, ECS assumes no responsibility regarding any response actions initiated as a result of these findings. General compliance with regulations and response actions are the sole responsibility of the Client and should be conducted in accordance with local, state, and/or federal requirements.

Appendix I: Figures

Figure 1

Site Location Map
Ebenezer Park
4490 Boatshore Road
Rock Hill, South Carolina
ECS Project No. 49-20058

Source: Google Earth

Figure 2

Site Location Map
Ebenezer Park
4490 Boatshore Road
Rock Hill, South Carolina
ECS Project No. 49-20058

LEGEND

XX-XX Sample Location

Lead Containing

No Lead or Asbestos Detected

NOTES:

Not to scale

Samples color coded

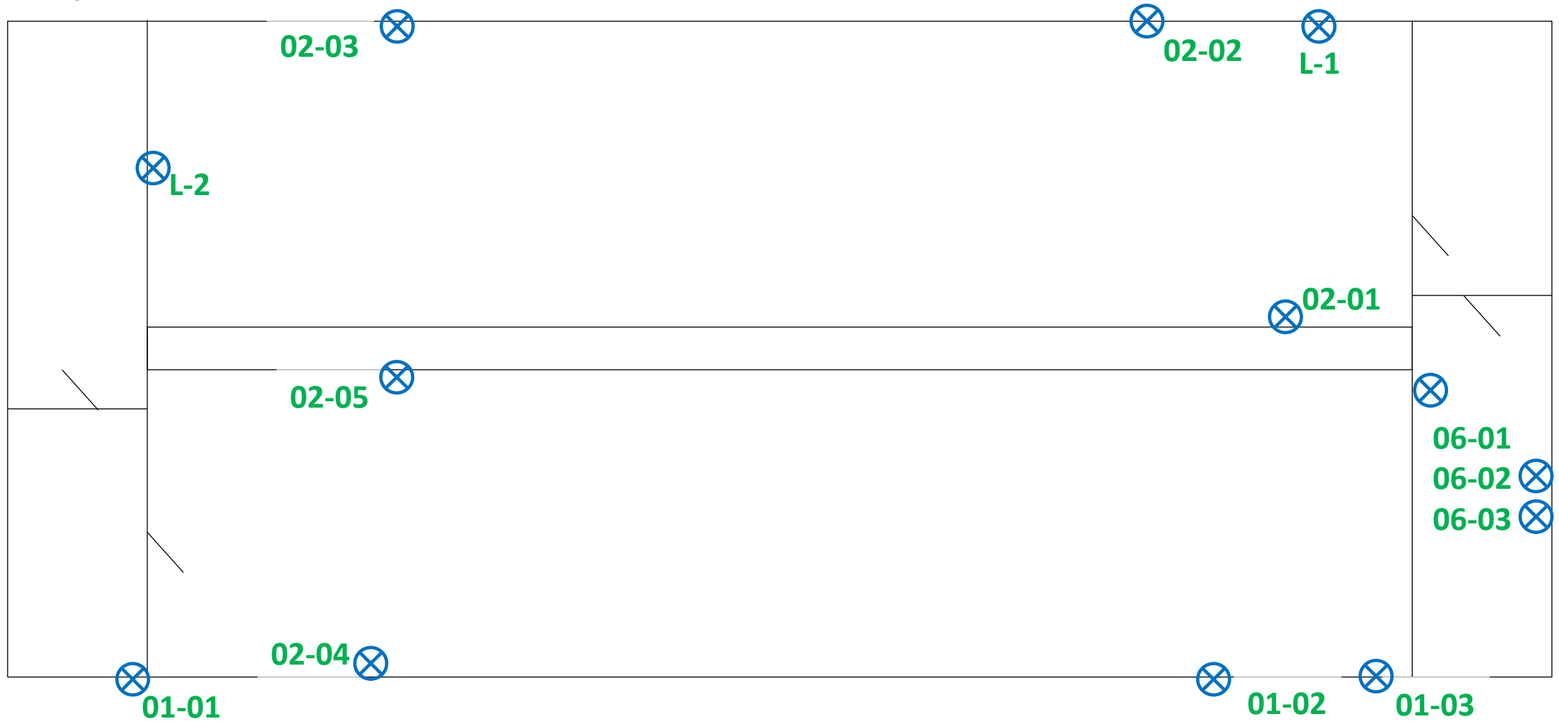


Figure 3

Site Location Map
Ebenezer Park
4490 Boatshore Road
Rock Hill, South Carolina
ECS Project No. 49-20058

LEGEND

XX-XX Sample Location

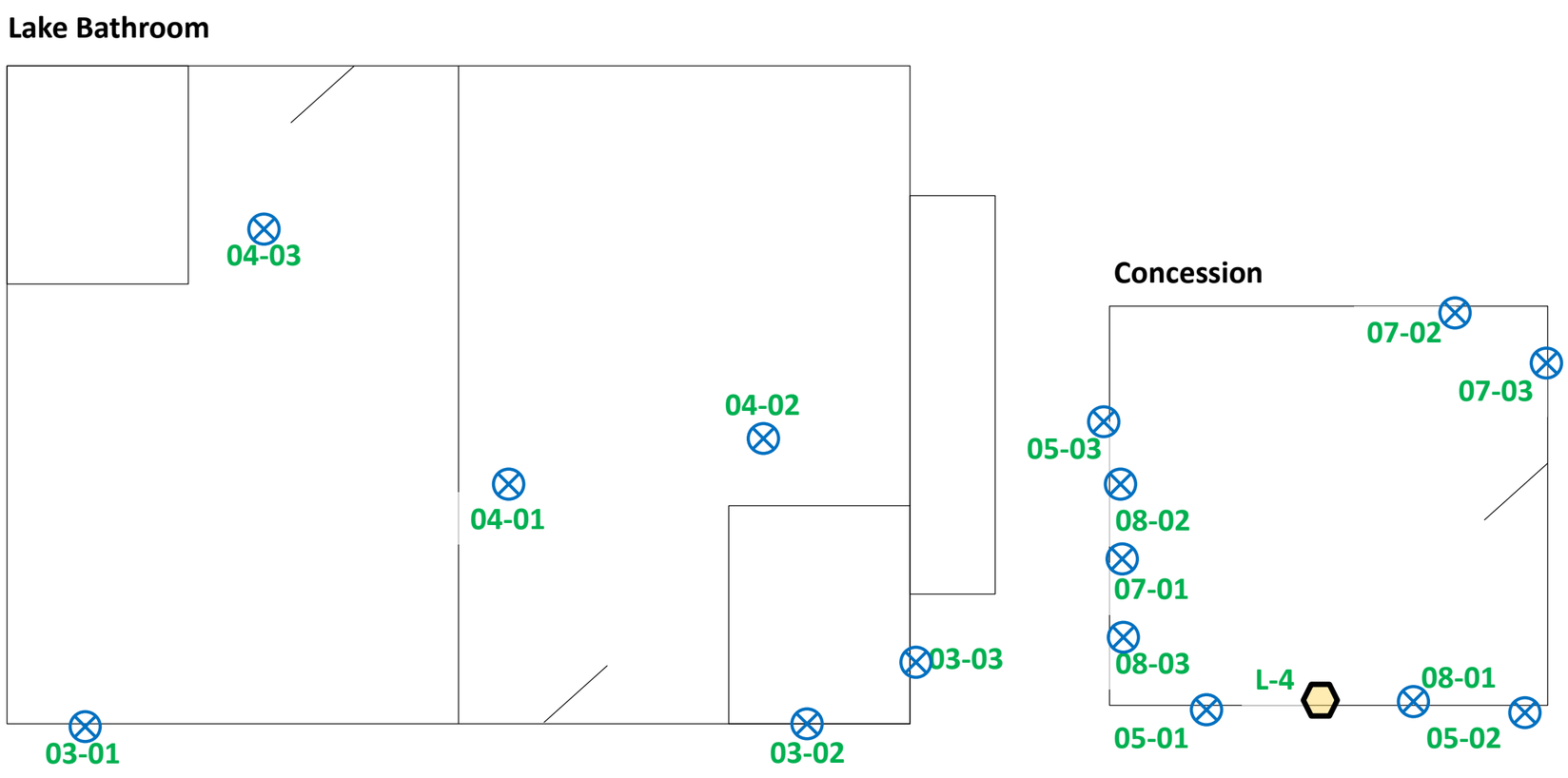
Lead Containing

No Lead or Asbestos Detected

NOTES:

Not to scale

Samples color coded



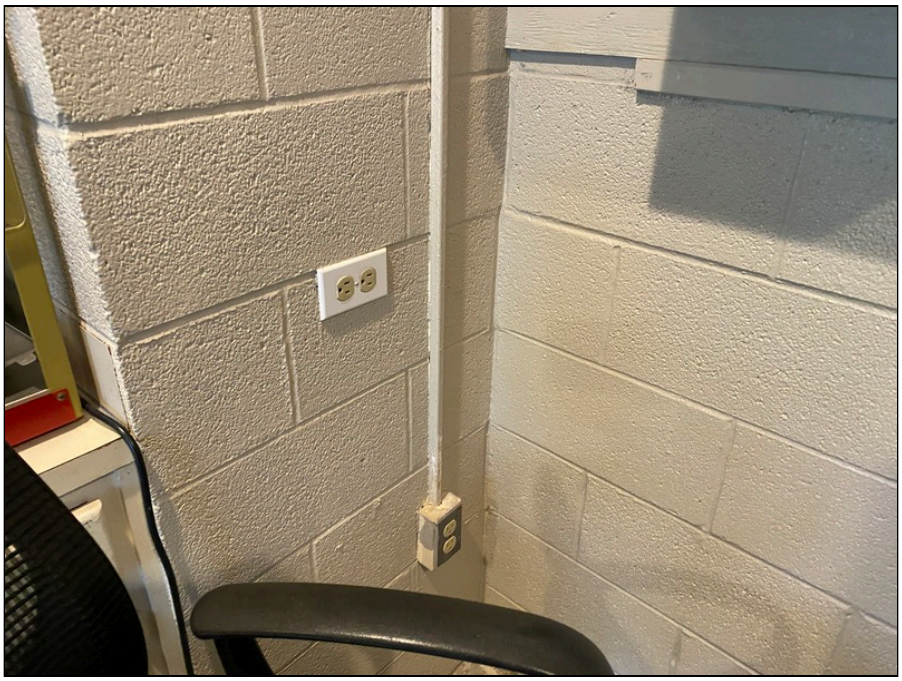
Appendix II: Site Photographs

1 - Typical view of the subject site.

2 - View of the interior.

3 - Additional view of the interior.

4 - View of the wall chase.



5 - View of lead containing paint in the concession stand.

Appendix III: Asbestos Bulk Sample Results

PLM Due 4/12/23 @ 5:00pm

CHAIN OF CUSTODY

TEM due 4/19/23 @ 5:00pm

(26)

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730 SE Maynard Road, Cary, NC 27511
Tel: 866-481-1412; Fax: 919-481-1442

LAB USE ONLY:	
CEI Lab Code:	SA230642 ST230336
CEI Lab I.D. Range:	

COMPANY INFORMATION		PROJECT INFORMATION	
CEI CLIENT #:		Job Contact:	
Company:	ECS Southeast	Email / Tel:	
Address:	1812 Center Park Drive Charlotte NC	Project Name:	Ebenezer Park
		Project ID#:	20055
Email:	asayre@ecslimited.com	PO #:	
Tel:	Fax:	STATE SAMPLES COLLECTED IN:	SC

IF TAT IS NOT MARKED STANDARD 3 DAY TAT APPLIES.

ASBESTOS	METHOD	TURN AROUND TIME					
		4 HR	8 HR	1 DAY	2 DAY	3 DAY	5 DAY
PLM BULK	EPA 600	☐	☐	☐	☐	☑	☑
PLM POINT COUNT (400)	EPA 600	☐	☐	☐	☐	☐	☐
PLM POINT COUNT (1000)	EPA 600	☐	☐	☐	☐	☐	☐
PLM GRAV w POINT COUNT	EPA 600		☐	☐	☐	☐	☐
PLM BULK	CARB 435		☐	☐	☐	☐	☐
PCM AIR	NIOSH 7400	☐	☐	☐	☐	☐	☐
TEM AIR	EPA AHERA	☐	☐	☐	☐	☐	☐
TEM AIR	NIOSH 7402	☐	☐	☐	☐	☐	☐
TEM AIR (PCME)	ISO 10312	☐	☐	☐	☐	☐	☐
TEM AIR	ASTM 6281-15	☐	☐	☐	☐	☐	☐
TEM BULK	CHATFIELD		☐	☐	☐	☐	☑
TEM DUST WIPE	ASTM D6480-05 (2010)	☐	☐	☐	☐	☐	☐
TEM DUST MICROVAC	ASTM D5755-09 (2014)	☐	☐	☐	☐	☐	☐
TEM SOIL	ASTM D7521-16			☐	☐	☐	☐
TEM VERMICULITE	CINCINNATI METHOD			☐	☐	☐	☐
TEM QUALITTATIVE	IN-HOUSE METHOD		☐	☐	☐	☐	☐
OTHER:		☐	☐	☐	☐	☐	☐

REMARKS / SPECIAL INSTRUCTIONS:

Positive Stop

☒ Accept Samples

☐ Reject Samples

Relinquished By:	Date/Time	Received By:	Date/Time
	4/7/23		4/12/23 11:30Am

Samples will be disposed of 30 days after analysis

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SAMPLING FORM

COMPANY CONTACT INFORMATION	
Company:	Job Contact:
Project Name:	
Project ID #:	Tel:

SAMPLE ID#	DESCRIPTION / LOCATION	VOLUME/ AREA	TEST	
01-01,02,03	Asphalt shingle & felt		PLM ✓	TEM ✓
02-01,02,03,04,05	Masonry block filler		PLM	TEM
03-01,02,03	Asphalt Shingle & felt		PLM	TEM ✓
04-01,02,03	Block filler		PLM	TEM
05-01,02,03	Asphalt shingle & felt		PLM	TEM ✓
06-01,02,03	Drywall and joint compound		PLM	TEM
07-01,02,03	Block filler		PLM	TEM
08-01,02,03	Drywall & joint compound		PLM ✓	TEM
			PLM	TEM
			PLM	TEM
			PLM	TEM
			PLM	TEM
			PLM	TEM
			PLM	TEM
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			PLM	TEM
			PLM	TEM

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April 12, 2023

ECS Southeast, LLC
1812 Center Park Drive, Suite D
Charlotte, NC 28217

CLIENT PROJECT: Ebenezer Park, 20058
CEI LAB CODE: SA230642

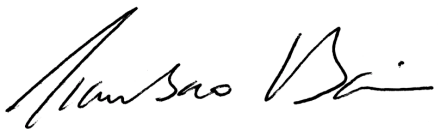
Dear Customer:

Enclosed are asbestos analysis results for PLM Bulk samples received at our laboratory on April 7, 2023. The samples were analyzed for asbestos using polarizing light microscopy (PLM) per the EPA 600 Method.

Sample results containing >1% asbestos are considered asbestos-containing materials (ACMs) per EPA regulatory requirements. The detection limit for the EPA 600 Method is <1% asbestos by weight as determined by visual estimation.

Thank you for your business and we look forward to continuing good relations.

Kind Regards,



Tianbao Bai, Ph.D., CIH
Laboratory Director

NVLAP TESTING
NVLAP LAB CODE: 600323-0

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ASBESTOS ANALYTICAL REPORT
By: Polarized Light Microscopy

Prepared for

ECS Southeast, LLC

CLIENT PROJECT: Ebenezer Park, 20058

LAB CODE: SA230642

TEST METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

REPORT DATE: 04/12/23

TOTAL SAMPLES ANALYZED: 23

SAMPLES >1% ASBESTOS:

2752 Pleasant Rd Suite 100A • Fort Mill, SC 29708 • 803.526.5146

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Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Ebenezer Park, 20058 **LAB CODE: SA230642**

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
01-01	Layer 1	SA230642.01	Black	Asphalt Shingle	None Detected
	Layer 2	SA230642.01	Black	Felt Paper	None Detected
01-02	Layer 1	SA230642.02	Black	Asphalt Shingle	None Detected
	Layer 2	SA230642.02	Black	Felt Paper	None Detected
01-03	Layer 1	SA230642.03		Sample Submitted for TEM Analysis	
	Layer 2	SA230642.03		Sample Submitted for TEM Analysis	
02-01		SA230642.04	White	Masonry Block Filler	None Detected
02-02		SA230642.05	White	Masonry Block Filler	None Detected
02-03		SA230642.06	White	Masonry Block Filler	None Detected
02-04		SA230642.07	White	Masonry Block Filler	None Detected
02-05		SA230642.08	White	Masonry Block Filler	None Detected
03-01	Layer 1	SA230642.09	Black	Asphalt Shingle	None Detected
	Layer 2	SA230642.09	Black	Felt Paper	None Detected
03-02	Layer 1	SA230642.10	Black	Asphalt Shingle	None Detected
	Layer 2	SA230642.10	Black	Felt Paper	None Detected
03-03	Layer 1	SA230642.11		Sample Submitted for TEM Analysis	
	Layer 2	SA230642.11		Sample Submitted for TEM Analysis	
04-01		SA230642.12	White	Block Filler	None Detected
04-02		SA230642.13	White	Block Filler	None Detected
04-03		SA230642.14	White	Block Filler	None Detected
05-01	Layer 1	SA230642.15	Black	Asphalt Shingle	None Detected
	Layer 2	SA230642.15	Black	Felt Paper	None Detected
05-02	Layer 1	SA230642.16	Black	Asphalt Shingle	None Detected
	Layer 2	SA230642.16	Black	Felt Paper	None Detected
05-03	Layer 1	SA230642.17		Sample Submitted for TEM Analysis	
	Layer 2	SA230642.17		Sample Submitted for TEM Analysis	
06-01	Layer 1	SA230642.18	White	Joint Compound	None Detected

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Ebenezer Park, 20058 **LAB CODE: SA230642**

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
	Layer 2	SA230642.18	Brown,Tan	Drywall	None Detected
06-02	Layer 1	SA230642.19	White	Joint Compound	None Detected
	Layer 2	SA230642.19	Brown,Tan	Drywall	None Detected
06-03	Layer 1	SA230642.20	White	Joint Compound	None Detected
	Layer 2	SA230642.20	Brown,Tan	Drywall	None Detected
07-01		SA230642.21	White	Block Filler	None Detected
07-02		SA230642.22	White	Block Filler	None Detected
07-03		SA230642.23	White	Block Filler	None Detected
08-01	Layer 1	SA230642.24	White	Joint Compound	None Detected
	Layer 2	SA230642.24	Off-white,Tan	Drywall	None Detected
08-02	Layer 1	SA230642.25	White	Joint Compound	None Detected
	Layer 2	SA230642.25	Off-white,Tan	Drywall	None Detected
08-03	Layer 1	SA230642.26	White	Joint Compound	None Detected
	Layer 2	SA230642.26	Off-white,Tan	Drywall	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: ECS Southeast, LLC
1812 Center Park Drive, Suite D
Charlotte, NC 28217

Lab Code: SA230642
Date Received: 04-07-23
Date Analyzed: 04-12-23
Date Reported: 04-12-23

Project: Ebenezer Park, 20058

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
01-01 Layer 1 SA230642.01	Asphalt Shingle	Heterogeneous Black Fibrous Bound	50%	Fiberglass	40% 10%	Tar Gravel	None Detected
Layer 2 SA230642.01	Felt Paper	Homogeneous Black Fibrous Bound	70%	Cellulose	30%	Tar	None Detected
01-02 Layer 1 SA230642.02	Asphalt Shingle	Heterogeneous Black Fibrous Bound	50%	Fiberglass	40% 10%	Tar Gravel	None Detected
Layer 2 SA230642.02	Felt Paper	Homogeneous Black Fibrous Bound	70%	Cellulose	30%	Tar	None Detected
01-03 Layer 1 SA230642.03	Sample Submitted for TEM Analysis						
Layer 2 SA230642.03	Sample Submitted for TEM Analysis						
02-01 SA230642.04	Masonry Block Filler	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Silicates Binder Paint	None Detected
02-02 SA230642.05	Masonry Block Filler	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Silicates Binder Paint	None Detected

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ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: ECS Southeast, LLC
1812 Center Park Drive, Suite D
Charlotte, NC 28217

Lab Code: SA230642
Date Received: 04-07-23
Date Analyzed: 04-12-23
Date Reported: 04-12-23

Project: Ebenezer Park, 20058

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
02-03 SA230642.06	Masonry Block Filler	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Silicates Binder Paint	None Detected
02-04 SA230642.07	Masonry Block Filler	Heterogeneous White Non-fibrous Loosely Bound			65l% 30% 5%	Silicates Binder Paint	None Detected
02-05 SA230642.08	Masonry Block Filler	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Silicates Binder Paint	None Detected
03-01 Layer 1 SA230642.09	Asphalt Shingle	Heterogeneous Black Fibrous Bound	50%	Fiberglass	40% 10%	Tar Gravel	None Detected
Layer 2 SA230642.09	Felt Paper	Homogeneous Black Fibrous Bound	70%	Cellulose	30%	Tar	None Detected
03-02 Layer 1 SA230642.10	Asphalt Shingle	Heterogeneous Black Fibrous Bound	50%	Fiberglass	40% 10%	Tar Gravel	None Detected
Layer 2 SA230642.10	Felt Paper	Homogeneous Black Fibrous Bound	70%	Cellulose	30%	Tar	None Detected
03-03 Layer 1 SA230642.11	Sample Submitted for TEM Analysis						

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: ECS Southeast, LLC
1812 Center Park Drive, Suite D
Charlotte, NC 28217

Lab Code: SA230642
Date Received: 04-07-23
Date Analyzed: 04-12-23
Date Reported: 04-12-23

Project: Ebenezer Park, 20058

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
Layer 2 SA230642.11	Sample Submitted for TEM Analysis						
04-01 SA230642.12	Block Filler	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Silicates Binder Paint	None Detected
04-02 SA230642.13	Block Filler	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Silicates Binder Paint	None Detected
04-03 SA230642.14	Block Filler	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Silicates Binder Paint	None Detected
05-01 Layer 1 SA230642.15	Asphalt Shingle	Heterogeneous Black Fibrous Bound	50%	Fiberglass	40% 10%	Tar Gravel	None Detected
Layer 2 SA230642.15	Felt Paper	Homogeneous Black Fibrous Bound	70%	Cellulose	30%	Tar	None Detected
05-02 Layer 1 SA230642.16	Asphalt Shingle	Heterogeneous Black Fibrous Bound	50%	Fiberglass	40% 10%	Tar Gravel	None Detected
Layer 2 SA230642.16	Felt Paper	Homogeneous Black Fibrous Bound	70%	Cellulose	30%	Tar	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: ECS Southeast, LLC
1812 Center Park Drive, Suite D
Charlotte, NC 28217

Lab Code: SA230642
Date Received: 04-07-23
Date Analyzed: 04-12-23
Date Reported: 04-12-23

Project: Ebenezer Park, 20058

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
05-03 Layer 1 SA230642.17	Sample Submitted for TEM Analysis						
Layer 2 SA230642.17	Sample Submitted for TEM Analysis						
06-01 Layer 1 SA230642.18	Joint Compound	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Binder Calc Carb Paint	None Detected
Layer 2 SA230642.18	Drywall	Heterogeneous Brown,Tan Fibrous Loosely Bound	20%	Cellulose	80%	Gypsum	None Detected
06-02 Layer 1 SA230642.19	Joint Compound	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Binder Calc Carb Paint	None Detected
Layer 2 SA230642.19	Drywall	Heterogeneous Brown,Tan Fibrous Loosely Bound	20%	Cellulose	80%	Gypsum	None Detected
06-03 Layer 1 SA230642.20	Joint Compound	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Binder Calc Carb Paint	None Detected
Layer 2 SA230642.20	Drywall	Heterogeneous Brown,Tan Fibrous Loosely Bound	20%	Cellulose	80%	Gypsum	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: ECS Southeast, LLC
1812 Center Park Drive, Suite D
Charlotte, NC 28217

Lab Code: SA230642
Date Received: 04-07-23
Date Analyzed: 04-12-23
Date Reported: 04-12-23

Project: Ebenezer Park, 20058

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
07-01 SA230642.21	Block Filler	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Silicates Binder Paint	None Detected
07-02 SA230642.22	Block Filler	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Silicates Binder Paint	None Detected
07-03 SA230642.23	Block Filler	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Silicates Binder Paint	None Detected
08-01 Layer 1 SA230642.24	Joint Compound	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Binder Calc Carb Paint	None Detected
Layer 2 SA230642.24	Drywall	Heterogeneous Off-white,Tan Fibrous Loosely Bound	15% 5%	Cellulose Fiberglass	80%	Gypsum	None Detected
08-02 Layer 1 SA230642.25	Joint Compound	Heterogeneous White Non-fibrous Loosely Bound			65% 30% 5%	Binder Calc Carb Paint	None Detected
Layer 2 SA230642.25	Drywall	Heterogeneous Off-white,Tan Fibrous Loosely Bound	15% 5%	Cellulose Fiberglass	80%	Gypsum	None Detected

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ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: ECS Southeast, LLC
1812 Center Park Drive, Suite D
Charlotte, NC 28217

Lab Code: SA230642
Date Received: 04-07-23
Date Analyzed: 04-12-23
Date Reported: 04-12-23

Project: Ebenezer Park, 20058

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
08-03	Joint Compound	Heterogeneous			65%	Binder	None Detected
Layer 1		White			30%	Calc Carb	
SA230642.26		Non-fibrous			5%	Paint	
		Loosely Bound					
Layer 2	Drywall	Heterogeneous	15%	Cellulose	80%	Gypsum	None Detected
SA230642.26		Off-white,Tan	5%	Fiberglass			
		Fibrous					
		Loosely Bound					

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LEGEND: Non-Anth = Non-Asbestiform Anthophyllite
Non-Trem = Non-Asbestiform Tremolite
Calc Carb = Calcium Carbonate

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

REPORTING LIMIT: <1% by visual estimation

REPORTING LIMIT FOR POINT COUNTS: 0.25% by 400 Points or 0.1% by 1,000 Points

REGULATORY LIMIT: >1% by weight

Due to the limitations of the EPA 600 method, nonfriable organically bound materials (NOBs) such as vinyl floor tiles can be difficult to analyze via polarized light microscopy (PLM). EPA recommends that all NOBs analyzed by PLM, and found not to contain asbestos, be further analyzed by Transmission Electron Microscopy (TEM). Please note that PLM analysis of dust and soil samples for asbestos is not covered under NVLAP accreditation. *Estimated measurement of uncertainty is available on request.*

This report relates only to the samples tested or analyzed and may not be reproduced, except in full, without written approval by Eurofins CEI. Eurofins CEI makes no warranty representation regarding the accuracy of client submitted information in preparing and presenting analytical results. Interpretation of the analytical results is the sole responsibility of the client. Samples were received in acceptable condition unless otherwise noted. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Information provided by customer includes customer sample ID and sample description.

ANALYST: Carter Bredin

APPROVED BY: Tianbao Bai, Ph.D., CIH
Laboratory Director

Miguel Angel Maysonet

NVLAP TESTING
NVLAP LAB CODE: 600323-0

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April 19, 2023

ECS Southeast, LLC
1812 Center Park Drive, Suite D
Charlotte, NC 28217

CLIENT PROJECT: Ebenezer Park, 20058
LAB CODE: ST230336

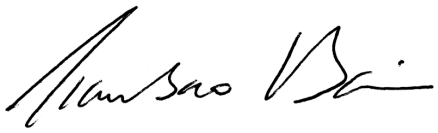
Dear Customer:

Enclosed are asbestos analysis results for TEM bulk samples received at our laboratory on April 12, 2023. The samples were analyzed for asbestos using transmission electron microscopy (TEM) per Chatfield/EPA 600/R-93/116 Sec. 2.5.5.1 method.

Sample results containing > 1% asbestos are considered asbestos-containing materials (ACMs) per the EPA regulatory requirements. The detection limit for the TEM Chatfield/EPA 600/R-93/116 Sec. 2.5.5.1 method is <1% depending on the processed weight and constituents of the sample.

Thank you for your business and we look forward to continuing good relations.

Kind Regards,



Tianbao Bai, Ph.D., CIH
Laboratory Director

eurofins | CEI

ASBESTOS ANALYTICAL REPORT
By: Transmission Electron Microscopy

Prepared for

ECS Southeast, LLC

CLIENT PROJECT: Ebenezer Park, 20058

LAB CODE: ST230336

TEST METHOD: Bulk Chatfield
EPA 600 / R93 / 116 Sec. 2.5.5.1

REPORT DATE: 04/19/23

2752 Pleasant Rd Suite 100A • Fort Mill, SC 29708 • 803.526.5146

ASBESTOS BULK ANALYSIS

By: TRANSMISSION ELECTRON MICROSCOPY

Client: ECS Southeast, LLC
1812 Center Park Drive, Suite D
Charlotte, NC 28217

Project: Ebenezer Park, 20058

Lab Code: ST230336
Date Received: 04-12-23
Date Analyzed: 04-19-23
Date Reported: 04-19-23

TEM BULK CHATFIELD / EPA 600 / R93 / 116 Sec. 2.5.5.1

Client ID Lab ID	Material Description	Sample Weight (g)	Organic Material %	Acid Soluble Material %	Acid Insoluble Material %	Asbestos %
01-03 ST05341	Black Asphalt Shingle	0.2506	22.8	39.7	37.5	**None Detected**
01-03 ST05342	Black Felt Paper	0.0755	94	5.4	.6	**None Detected**
03-03 ST05343	Black Asphalt Shingle	0.2831	26.7	29.6	43.7	**None Detected**
03-03 ST05344	Black Felt Paper	0.2053	96.9	2.1	1	**None Detected**
05-03 ST05345	Black Asphalt Shingle	0.2967	25.2	33.9	40.9	**None Detected**
05-03 ST05346	Black Felt Paper	0.1068	93.6	1.1	5.3	**None Detected**

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LEGEND: None

METHOD: CHATFIELD & EPA/600/R-93/116 Sec. 2.5.5.1

LIMIT OF DETECTION: Varies with the weight and constituents of the sample (<1%)

REGULATORY LIMIT: >1% by weight

This report relates only to the samples tested or analyzed and may not be reproduced, except in full, without written approval by Eurofins CEI (ECEI). ECEI makes no warranty representation regarding the accuracy of client submitted information in preparing and presenting analytical results. Interpretation of the analytical results is the sole responsibility of the client. *Estimated measurement of uncertainty is available on request and in compliance with regulatory requirements.* Samples were received in acceptable condition unless otherwise noted.

Information provided by customer includes customer sample ID, location, volume and area as well as date and time of sampling.
ECEI recommends between 0.20 and 0.50 grams of sample material for TEM bulk analysis.
Any weight below 0.10 grams is considered below protocol guidelines.
***Indicates sample weight below 0.05 grams and is considered insufficient for quantitative analysis.*

ANALYST: Adrian Meyer

APPROVED BY: Tianbao Bai, Ph.D., CIH
Laboratory Director

Appendix IV: Lead Laboratory Analytical Results

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2752 Pleasant Rd Suite 100A • Fort Mill, SC 29708

TEL: 803-526-5146

LABORATORY REPORT
LEAD IN PAINT

Client: **ECS Southeast, LLC**
1812 Center Park Drive, Suite D
Charlotte, NC 28217

Lab Code: SC230038
Received: 04-07-23
Analyzed: 04-13-23
Reported: 04-14-23

Project: Ebenezer Park, 20058

METHOD: EPA SW846 7000B

CLIENT ID	LAB ID	PPM (µg/g)	CONCENTRATION % BY WEIGHT
L-1	SCA0662	<46	**<0.0046**
L-2	SCA0663	<45	**<0.0045**
L-3	SCA0664	<50	**<0.0050**
L-4	SCA0665	56	**0.0056**

2752 Pleasant Rd Suite 100A • Fort Mill, SC 29708

TEL: 803-526-5146

Project: Ebenezer Park, 20058

Lab Code: SC230038

METHOD: EPA SW846 7000B

CLIENT ID	LAB ID	PPM (µg/g)	CONCENTRATION % BY WEIGHT

Reviewed By:

Tianbao Bai, Ph.D.
Laboratory Director

This method has been validated for sample weights of 0.020g or greater. When samples with a weight of less than that are analyzed those results fall outside of the scope of accreditations.
*** The analysis of composite wipe samples as a single samples is not included under AIHA accreditation.**

Minimum reporting limit is 10 µg total lead. Sample results denoted with a “less than” (<) sign contain less than 10.0 µg total lead, based on a 40ml sample volume.

Lead samples are not analyzed by Eurofins CEI Lead samples are submitted to an AIHA ELLAP accredited laboratory for lead analysis of soil, dust, paint, and TCLP samples.
Laboratory results represent the analysis of samples as submitted by the client. Information regarding sample location, description, area, volume, etc., was provided by the client. Unless notified in writing to return samples, Eurofins CEI discards client samples after 30 days. This report shall not be reproduced, except in full, without the written consent of Eurofins CEI.

Information provided by customer includes customer sample ID, location, volume and area as well as date and time of sampling.

REGULATORY LIMITS

OSHA Standard: No safe limit.
Consumer Products Safety Standard: Greater than 0.009% lead by weight.
Federal Lead Standard / HUD: 0.5% lead by weight.

LEGEND

µg = microgram	ppm = parts per million	g = grams
ml = milliliter	Pb = lead	wt = weight

End of Report

Dw 4/14/23 5:00Pm

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CHAIN OF CUSTODY (4)

2752 Pleasant Rd. Suite 100A Fort Mill, SC 29708
Tel: 803-526-5146; Fax: 919-481-1442

LAB USE ONLY:
ECEI Lab Code: SC230038
ECEI Lab I.D. Range:

COMPANY INFORMATION	PROJECT INFORMATION
ECEI CLIENT #:	Job Contact:
Company: ECS Southeast, LLP	Email / Tel:
Address: 1812 Center Park Drive	Project Name: ~~2000~~ Ebenezer
Charlotte NC	Project ID# 20058
Billing Email: cscyre@ecslimited.com	PO #:
Tel:	STATE SAMPLES COLLECTED IN:

ECEI standard terms are Net 30 days

IF TAT IS NOT MARKED STANDARD 3 DAY TAT APPLIES.

Analyte	METHOD	TURN AROUND TIME					
		4 HR	8 HR	1 DAY	2 DAY	3 DAY	5 DAY
LEAD PAINT	EPA SW846 7000B / 3rd Ed. 7420/3050B		☐	☐	☐	☐	☑
LEAD WIPE	EPA SW846 7000B / 3rd Ed. 7420/3050B		☐	☐	☐	☐	☐
LEAD SOIL	EPA SW846 7000B / 3rd Ed. 7420/3050B		☐	☐	☐	☐	☐
LEAD AIR	EPA SW846 7000B / NIOSH 7082		☐	☐	☐	☐	☐
OTHER:			☐	☐	☐	☐	☐

REMARKS:

☒ Accept Samples
☐ Reject Samples

Relinquished By:	Date/Time	Received By:	Date/Time
	4/7	Smp	4/7/23 11:30Am

Samples will be disposed of 30 days after analysis
By submitting samples, you are agreeing to ECEI's Terms and Conditions. Standard billing terms are NET 30

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SAMPLING FORM

COMPANY CONTACT INFORMATION	
Company:	Job Contact:
Project Name:	
Project ID #:	Tel:

SAMPLE ID#	DESCRIPTION / LOCATION	VOLUME/AREA	COMMENTS
L-1	Beige - CMV		
L-2	Teal - CMV		
L-3	Beige - CMV Lake		
L-4	Gray/Beige - CMV - concessions		

Appendix V: Certifications/ Licenses

SCDHEC ISSUED

Asbestos ID Card

Alex Sayre

		Expiration Date:
CONSULTBI	BI-01337	03/06/24
CONSULTPD	PD-00212	11/08/23

SECTION 024113 - SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY OF WORK:

A. This section covers all work associated with the demolition and removal of site features as indicated on the drawings, as specified herein and as otherwise required to accomplish other work associated with the contract.

1.2 SUBMITTALS

A. None this section.

1.3 REGULATORY REQUIREMENTS

A. Comply with federal, state, and local demolition, hauling and disposal regulations.

1.4 CRITERIA FOR BIDDING

A. Lump Sum Price

1. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which is it associated and shall be included in the lump sum price. The price shall be full compensation for all labor, materials, and equipment necessary to properly demolish and dispose of off-site all facilities shown to be removed on the construction plans and as specified herein including any testing, construction supervision and all other work required for satisfactory completion of site demolition operations. Base bids on the following criteria:

a. Structures to be relocated will be vacated prior to start of the work.
b. The Owner assumes no responsibility for the condition of the structures to be relocated.
c. Items of salvageable value to the Owner shall be stockpiled on site.
d. Explosives shall not be brought to the site.
e. Burning will not be allowed.
f. Contractor is responsible for permits, fees and licenses.

B. Unit Prices

1. None in this Section.

1.5 QUALITY ASSURANCE

A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.

B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.

C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.

D. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 DEMOLITION

A. Demolish structures completely, safely, and remove from the site using methods required by governing regulations. Small structures may be removed intact when acceptable to the Owner and authorities having jurisdiction.

B. Proceed with demolition in a systematic manner.

C. Demolish concrete and masonry in small sections. Break up and remove concrete slabs-on-grade unless otherwise shown to remain.

D. Demolish and remove below grade construction and concrete slabs on grade to a minimum depth of two feet below proposed subgrade.

E. Provide full depth sawcuts through all pavements to be removed. Sawcuts shall be neat, straight and vertical.

3.2 FILLING BASEMENTS AND VOIDS

A. Completely fill below grade areas and voids resulting from demolition or removal of structures (underground fuel storage tanks, wells, cisterns, etc.) using approved fill materials as specified in SECTION 312000 “EARTH MOVING”.

B. Ensure that areas to be filled are free of standing water, frost, frozen material, trash and debris prior to fill placement.

C. Place and compact fill materials as specified by SECTION 312000 “EARTH MOVING”.

D. Grade surface to match adjacent grades and to provide flow to surface drainage structures after fill placements and compaction.

3.3 DISPOSAL OF DEMOLISHED MATERIALS

A. Dispose of demolished materials in accordance with current local, state and federal regulations. All cost in connection with disposing of demolished materials will be the responsibility of the Contractor.

B. Do not burn any material, debris, or trash on-site.

3.4 PROTECTIONS

A. Ensure safe passage of persons around all areas.

B. Conduct operations to prevent damage to adjacent buildings, structures, or other facilities, trees, vegetation, or injury to persons, etc.

C. Promptly repair damages caused to adjacent facilities by demolition operations at no additional cost to the Owner.

D. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition and/or relocation operations.

E. Prevent interruption of existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction.

F. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities.

G. Make arrangements, before initiating demolition, for relocating, disconnecting, rerouting, abandoning, or similar action as may be required relative to utilities and other underground piping, to permit work to proceed without delay. Arrangements shall be made in accordance with the regulations of authorities of utilities concerned, including, but not limited to overhead and underground power and telephone lines and equipment, gas piping, storm sewers, sanitary sewers, or water piping. The Contractor shall not use water when it may create hazardous or objectionable conditions, such as ice, flooding, and/or pollution.

H. Use water sprinkling and other suitable methods to limit dust and dirt rising and scattering into the air to lowest practical level.

I. Comply with governing regulations pertaining to environmental protection.

3.5 INSPECTIONS

A. Inspections

1. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.
2. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours notice for all required observations or tests.

B. Acceptance

1. Final acceptance will be based on a satisfactory demolition as approved by the Engineer. Demolition work shall be re-worked to the satisfaction of the Engineer until specified requirements are met. All additional work, which is the result of a failed inspection, shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 024113

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Slabs-on-grade.

B. Products installed, but not furnished, under this Section include the following:

1. Anchor rods and embed plates indicated to be cast into cast-in-place concrete, furnished under Division 05 Section "Structural Steel Framing"

C. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.

2. Division 32 Section "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

A. Contractor’s Statement of Responsibility Per Division 01 Section "Collective Inspections and Structural Testing"

B. Product Data:

1. Bar supports
2. Vapor retarders
3. Epoxy Bonding Adhesive
4. Cartridge Injection Adhesive
5. Evaporation retarder
6. Curing compound
7. Curing and sealing compound
8. Semirigid joint filler

9. Joint-filler strips
10. Controlled low-strength material, including design mixture.

C. Design Mixtures: For each concrete mixture.

1. Mix design submittals shall include test results and/or trial batch data that meet or exceed the required average compressive strength as required by ACI 301.
2. Trial batches shall consist of identical cementitious materials, fine and course aggregates, and admixtures to be used for mix design.
3. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
4. Design mixtures shall be coordinated with means of transport from point of delivery to point of placement. Allowances shall be made for changes in properties due to means of transport (from point of delivery to point of placement).
5. For mixes to be transported (i.e. pumped) from point of delivery to point of placement include a statement as to the expected property changes (i.e. unit weight and air content) from point of delivery to point of placement.

D. Steel Reinforcement Shop Drawings:

1. Drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and bar supports for concrete reinforcement.
3. Identify all step footing locations and associated reinforcing
4. Identify and dimension all grade beam and tie beam construction joints
5. Include slab on grade construction joint reinforcement
6. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
    a. Location of construction joints is subject to approval of the Architect.

E. Qualification Data:

1. For ready-mix concrete manufacturer.
2. For Cartridge injection adhesive installer. Include manufacturer's training certificates or letter from manufacturer certifying training was complete with a list of individuals that were trained

F. Material Certificates: For each of the following indicating compliance with the required standards and signed by manufacturers:

1. Vapor retarders

G. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Capillary Barriers

H. Research/Evaluation Reports:

1. Submit ICC reports for the following:

    a. Cartridge Injection Adhesive
    b. Mechanical Couplers (As used)
    c. Form Saving Mechanical Couplers (As used)
    d. Mechanical End Anchors (As used)

I. Hot Weather Program (As required, see below):
1. Describe in detail procedure for working in Hot Weather when concrete temperatures exceed the specified limits. Included detailed description of methods, materials, and equipment to be used to comply with requirements.

J. Substitutions for Cartridge Injection Adhesive:

1. Substitution requests may only be made using products with ICC-ESR reports for the product in the specific substrate.
2. Substitution request shall include signed and sealed calculations demonstrating that the product is capable of providing equivalent performance of the specified product for each specific location and condition when calculated using the data in the referenced ESR report and in accordance with the appropriate design procedure and standards required by the building code.
3. Substitution request shall specify the diameter and embedment depth of the substituted product
4. Any increase in material cost resulting from the substitution shall be the responsibility of the contractor.

K. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Installer Qualifications: The installer shall be experienced placing, finishing, curing, treating and protecting concrete equal in material, design and scope to that required for this project

C. Cartridge Injection Adhesive Installer Training: Conduct a thorough training session with the manufacturer's representative. Each individual responsible for the installation of anchors shall attend the training session. Training shall consist of a review of the complete process for the installation of the anchors and the use of proper equipment for drilling and installing the anchors, to include but not limited to:

1. Hole drilling procedure. Clarify acceptability of rotary hammer drilling and/or core drilling.
2. Hole drilling equipment
3. Type and diameter of drill bits
4. Hole preparation and hole cleaning technique
5. Hole cleaning equipment
6. Adhesive injection technique
7. Adhesive injection equipment
8. Adhesive curing requirements

D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

E. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

G. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

3. ACI 318, “Building Code Requirements for Structural Concrete”.

H. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement:

1. Deliver, store, and handle steel reinforcement to prevent bending and damage.
2. Maintain reinforcement free of dirt and other deleterious materials.
3. Store reinforcing on dunnage or other supports up off of ground.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will 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.
   a. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. 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.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars:

1. ASTM A 615/A 615M, deformed, Grade 60.

B. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Concrete Brick, Standees, Bolsters, chairs, spacers, supplementary reinforcing steel and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place including measures for supporting and anchoring reinforcing intermediate and top layers of reinforcing. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. Concrete brick supports are limited to use in supporting the bottom mat of below grade foundation reinforcing steel. Concrete brick supports shall consist of solid units of unit strength equal to or greater than associated foundation concrete. Submit material test reports for approval.

C. Cartridge Injection Adhesive: A two part adhesive injection system for anchorage of new reinforcing steel to existing concrete construction.

1. Where adhesive manufacturer is not indicated, subject to compliance with requirements and acceptance by the Architect, provide the following or approved equal:

    a. Hilt HIT RE 500 V3 Adhesive Anchorage System, ICC ESR-3814.

2. Where specifically indicated in the contract documents provide the following:

    a. Hilti HIT –HY 200 Adhesive Anchorage System, ICC ESR-3187

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, Type I/II or Type III unless noted otherwise. Supplement with Fly Ash: ASTM C 618, Class F.

B. Normal-Weight Aggregates: ASTM C 33, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Coarse Aggregate

    a. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
    b. Class: Per ASTM C33 requirements for the concrete use and region of the project

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Accelerating Admixture: Non-Chloride, ASTM C494/494M, Type C.
4. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A, minimum 15 mil thickness.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Stego Industries LLC; Stego Wrap 15-Mil Vapor Barrier.
b. Fortifiber Corporation; Moistop Ultra A.
c. Raven Industries Inc.; Vapor Block 15.
d. Reef Industries, Inc.; Griffolyn Type-65G.
e. W.R. Meadows, Inc.; Sealtight Vapormat 15.
f. Poly-America; Yellow Guard 15.

2. Seam Tape: Manufacturer's recommended adhesive or pressure-sensitive tape.

2.7 CAPILLARY BARRIERS:.

A. A clean, compactable and trimmable granular fill with material passing the No. 200 sieve having less than 3 percent clay or friable particles. The material shall remain stable and support construction traffic and complying with one of the following:

1. A local state DOT approved road base material with 100 percent passing the 1 ½" sieve, 15 to 55 percent passing the No. 4 sieve, and less than 5% passing the No. 200 sieve.

2.8 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: Provide one of the following.

1. Flexible lightweight, non-staining, polythelene, closed cell, non-absorbent, uv stable, compressible foam with a pre-scored removable strip to allow for clean and uniform sealant joint as follows:

a. Density: ASTM D1751
b. Compression: ASTM D3575

1) 10% Deflection: 10 psi maximum
2) 80% Deflection: 126 psi maximum

c. Water absorption: ASTM D3575, 0.5% volume maximum

2. Resilient, flexible, non-extruding, asphalt-saturated cellulosic fiber with preformed cap to allow for clean and uniform sealant joint

a. Density: ASTM D 1751

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Type V, for bonding freshly mixed concrete to hardened concrete.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Compressive Strengths: Compressive strengths specified are as required for structural design. Compressive strength provided shall be increased as required by ACI 318 for exposure class or as required for specialty treatments or finishing of concrete (i.e. polishing)

C. Air Content: Shall be adjusted as required for exposure class, specialty treatments or finishing of concrete.

D. Exposure Class: Unless noted otherwise in drawings or specifications concrete shall be considered exposure class F0, S0, W0 and C0.

E. Coordination with means of transport (from point of delivery to point of placement):

1. Design mixtures shall be coordinate with means of transport from point of delivery to point of placement. Allowances shall be made in the mix design for changes in properties due to means of transport (from point of delivery to point of placement). Specifically an allowance shall be made for loss of air entrainment due to transport methods (i.e concrete pump) when air entrainment is explicitly specified or where air entrainment is used as part of achieving lightweight concrete.

2. Coordinate with schedule of special inspections for instances in which concrete properties are to be explicitly confirmed at point of placement.

F. Admixtures: Use admixtures as noted in mix design and according to 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, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use accelerating admixture in concrete as required for cold weather conditions.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Dry Unit Weight: 145 lb/cu. ft. plus or minus 3 lb/cu. ft.

B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength:

a. Typical Slabs: 3000 psi at 28 days.
b. Polished Finished Slabs: Minimum 3500 psi at 28 days, but not less than typical slab strength

2. Dry Unit Weight: 145 lb/cu. ft. plus or minus 3 lb/cu. ft.
3. Air Content:

a. Coordinate target air content with exposure requirements
b. Maximum air content for slabs to receive trowel finish shall be 3 percent at point of placement.

4. Cementitious Materials:

a. Minimum Cementitious Materials Content: Per ACI 301 requirements based on max aggregate size
b. For slabs to receive a polished finish fly ash shall not be permitted

2.12 FABRICATING REINFORCEMENT

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

2.13 CONCRETE MIXING

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

1. Unless a detailed hot weather concrete plan incorporating the recommendations of ACI 305 has been submitted and approved comply with the following:

a. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes.
b. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

2.14 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150, [Type I] [Type II] [or] [Type III].
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33.
4. Foaming Agent: ASTM C 869.
5. Water: ASTM C 94/C 94M.
6. Air-Entraining Admixture: ASTM C 260.

B. Produce conventional-weight, controlled low-strength material with 80-psi compressive strength when tested according to ASTM C 495.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, 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.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Smooth-formed finished surfaces: Class A, 1/8 inch
2. Rough-formed finished surfaces: Class D, 1 inch

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Anchor rods and embeds shall be securely fastened in formwork prior to placing concrete, and concrete vibrated around the anchor or embed to ensure proper flow of concrete around anchors and embeds.
3. Anchor rod sleeves (where required) shall be accurately located and fastened in formwork prior to placing concrete.
4. Wet setting of anchor rods and embeds is not permitted.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Place vapor retarder with longest dimension parallel to direction of pour and face laps away from the expected direction of placement whenever possible.
2. Lap joints per manufacturer, but not less than 6 inches and seal with manufacturer's recommended tape or adhesive.
3. Extend vapor retarder to edge of slab in all cases.
4. At conditions terminating into a wall turn vapor retarder up wall, extend to top of slab and seal to wall with manufacturer's tape or mastic unless obstructed by dowels, waterstops or other elements or unless specifically required otherwise by manufacturer.

    a. Where specific conditions prevent turning vapor retarder up and sealing submit specific procedure for turning vapor retarder down and sealing to wall or footing.

5. Manufacturer's seam tape or mastic shall be applied to clean and dry vapor retarder in strict accordance with manufacturer's recommendations.
6. Seal all penetrations including pipes and permanent stakes per manufacturer's instructions.
7. Do not use non-permanent stakes driven through the vapor retarder.
8. Repair damaged areas with vapor retarder patch of the typical vapor retarder material sealed with manufacturer's tape or mastic in strict accordance with manufacturer's recommendations for repair.

3.6 CAPILLARY BARRIERS:

A. General: Place capillary barrier on compacted subgraded beneath vapor retarder for all slabs on grade unless noted otherwise.

1. Compact capillary barrier with mechanical equipment to an elevation tolerance of plus 0 and minus ¾ inch.
2. Capillary barriers are not required where mud slabs and below slab sheet waterproofing are indicated.
3. Ensure surface of capillary barrier is uniform to prevent damage to vapor retarders.
4. Ensure capillary barrier is compacted to a uniform surface free of ruts, divots or other anomalies from construction traffic. Repair any anomalies immediately prior to concrete placement.

3.7 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Anchorage of reinforcement into hardened concrete using cartridge injection adhesive anchors shall only be used where specifically indicated on plans or with written direction from the Engineer of Record for a specific location.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Foundation reinforcing steel may be supported on solid concrete brick units of strength equal to or greater than foundation concrete.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Welded Wire Reinforcement:

1. Install welded wire reinforcement in longest practicable lengths
2. Locate welded wire reinforcement in top 1/3 of slab on grades unless noted otherwise
3. Locate welded wire reinforcement at mid-depth of concrete slab thickness over deck flutes unless noted otherwise.
4. Lap edges and ends of adjoining sheets at least one mesh spacing plus 2", but not less than 6". Lace overlaps with wire.
5. Slabs on Grade 4" or less in thickness: Support welded wire reinforcement on chairs, bolsters or bar supports spaced to minimize sagging, and as required to support construction traffic

    a. Alternately, welded wire reinforcement may be placed on grade and "hooked"/pulled to the proper location
    b. Placement of welded wire reinforcement after placement of concrete and "walking in" is not permitted.

6. Slabs on Grade greater than 4" in thickness: Support welded wire reinforcement on chairs, bolsters or bar supports spaced to minimize sagging, and as required to support construction traffic

    a. Placement of welded wire reinforcement on grade and "hooked"/pulled up into slab as concrete is placed is not permitted.
    b. Placement of welded wire reinforcement after placement of concrete and "walking in" is not permitted.

7. Elevated slabs: Support welded wire reinforcement on chairs, bolsters or bar supports spaced to minimize sagging, and as required to support construction traffic

    a. Alternately, welded wire reinforcement may be placed on grade and "hooked"/pulled to the proper location
    b. Placement of welded wire reinforcement after placement of concrete and "walking in" is not permitted.

3.8 CARTRIDGE INJECTION ADHESIVE

A. Where manufacturer recommends the use of special tools for installation of anchors, such tools shall be used.

B. All facets of hole drilling, hole cleaning, anchor installation, anchor torqueing shall be in strict accordance with the ICC-ESR report and manufacturer's data.

C. Drill holes perpendicular to substrate surface.

D. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits as indicated in the ICC-ESR report.

E. Drill bits and core bits shall be of diameters indicated in the ICC-ESR report.

F. All holes shall be cleaned with compressed air to remove all drilling dust and other deleterious substances.

G. Remove water from holes to attain a surface dry condition unless specifically permitted otherwise by ICC-ESR report.

H. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete has achieved full design strength.

I. Hilti HIT-HY200 system adhesive shall be installed using the Hilti Safe Set Technology.

1. The Hilti hollow drill bit and Hilt vacuum system shall be employed.

J. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.

K. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

L. Follow manufacturer recommendations to ensure proper mixing of adhesive components.

M. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface.

N. Remove excess adhesive from the surface.

O. Shim reinforcement with suitable device to center the reinforcement in the hole.

P. Do not disturb or load reinforcment before manufacturer specified cure time has elapsed.

Q. Observe manufacturer recommendations with respect to installation temperatures.

3.9 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Provide supplemental reinforcing and/or smooth dowels where indicated at joints.
4. Strip bulkheads from footings, beams, grade beams, tie beams, and slabs and roughen surface of concrete to a minimum 1/4" amplitude while concrete is still plastic.
5. Form keyed joints unless indicated otherwise. Embed keys at least 1-1/2 inches into concrete unless noted otherwise.
6. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
7. Locate joints in slabs on steel deck as follows:

    a. Joints parallel to joists (perpendicular to girders) shall be located at the midpoint between two adjacent joists.
    b. Joints parallel to girders (perpendicular to joists) shall be located at the midpoint of two adjacent girders.
    c. Stagger and offset joints as required to meet the requirements.

8. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
9. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
10. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least [one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete.

    a. Cut joints as soon as cutting action will not tear, abrade, or otherwise damage surface , but not more than 12 hours after finished, and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "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, and embedded items is complete and that required inspections have been performed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 and as follows.

1. Do not add water to concrete unless the batched water is specifically noted as less than the mix design and is indicated as such on the batch ticket.
2. Do not add more water than the amount of withheld water which is specifically identified on the batch ticket.
3. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

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

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

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

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

E. Concrete placed over metal deck shall be placed and screeded level and flat to the specified tolerances, maintaining at least the minimum specified slab thickness as shown on drawings. The contractor shall increase slab thickness as required to compensate for metal deck deflection, residual beam camber and beam deflection in order to achieve a level and flat floor within the specified tolerance.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When 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.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 305.1 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement unless a detailed hot weather concrete plan incorporating the recommendations of ACI 305.1 has been submitted and approved. At no time shall concrete temperature exceed 95 deg F at time of placement.
2. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.11 FINISHING FORMED SURFACES

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

1. Apply to concrete surfaces not exposed to public view

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to be covered with a coating or covering material applied directly to concrete coordinate with Architectural drawings and specifications.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.12 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Finishing Tolerances:
1. Horizontal finishes will be accepted provided:
    a. Applicable specification requirements are satisfied.
    b. Water does not pond in areas sloped to drain.

c. Floor finish tolerances Ff/Fl for each completed floor area conform to the values indicated
d. Mean Local values for Flatness and Levelness are satisfied at all locations tested.
e. Accumulated deviation from intended true plane of finished surface does not exceed 1 inch.
f. Accuracy of concrete finish does not adversely affect installation and operation of movable equipment, floor supported items or items fitted to floor (doors, tracks, etc.).

C. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

D. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish, trowel and fine broom finish, or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
2. Apply to mud slabs.

E. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, epoxy terrazzo, polished or another thin-film-finish coating system.
2. Grind off any defects which would indicate through thin floor covering.
3. Finish surfaces to the following tolerances as measured by ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
   a. Slabs on Grade: Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
   b. Unshored Elevated Slabs: Specified overall values of flatness, F(F) 35 with minimum local values of flatness, F(F) 24.

F. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method without cleavage membrane. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

G. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

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

H. Provide final single direction finish on fiber reinforced concrete in order to knock the fibers down and embed them in the cement paste to the greatest extent possible

3.13 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.14 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Foundations:

1. Protect top sides of footings to receive masonry or concrete construction from dirt and debris.
2. Excavations:

    a. Do not allow excavations directly adjacent to or beneath footings to the absolute greatest extent possible.
    b. Where excavations must occur beneath in place footings or slabs the area shall be careful excavated as to not damage structural elements. The area shall be backfilled and compacted at the end of the work day.
    c. Areas excavated below footings shall be backfilled with Controlled Low-Strength Material.
    d. Areas excavated adjacent to and at or below footing elevation shall be backfilled with Controlled Low-Strength Material unless the area is large enough to be backfilled with control fill in lifts attaining proper compaction between lifts.

F. Slabs:

1. Protect slabs to remain expose, stained or receive other non-opaque floor coverings or treatments with impervious covers to prevent staining of the slab
2. Do not allow construction equipment or vehicles to drive on slabs.
3. Excavations:

    a. Do not allow excavations directly adjacent to or beneath slabs on grade to the absolute greatest extent possible.
    b. Where excavations must occur beneath in place footings or slabs the area shall be careful excavated as to not damage structural elements. The area shall be backfilled and compacted at the end of the work day.
    c. Areas excavated below slabs shall be backfilled with Controlled Low-Strength Material. Areas excavated adjacent to and at or below slab elevation shall be backfilled with Controlled Low-Strength Material unless the area is large enough to be backfilled with control fill in lifts attaining proper compaction between lifts.
    d. Repair vapor retarders per manufacturer's requirements

G. Cure concrete according to ACI 308.1, as follows:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments or polished finish.
    b. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

    a. Apply curing and sealing compound to areas of exposed concrete not to receive any floor treatment, staining, painting or floor covering. Coordinate with finish schedule.

3.15 CONCRETE REPAIRS

A. Where deficient concrete is identified on the job all repairs shall be subject to the EOR and AOR approval.

B. The contractor shall be responsible for enlisting a concrete repair specialists with no less than 5 years of documented concrete repair service and having repaired deficient conditions similar to those identified on no less than 5 projects in the previous five years.

C. The contractor and repair specialists shall prepare a narrative of the proposed repair including detailed methods and material, and submit for EOR approval prior to commencing with repairs.

D. Where repair of deficient work is to remain exposed, the deficient work shall be removed and replaced as directed by the EOR.

3.16 JOINT FILLING

A. Fill all joints in exposed concrete slabs

B. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

C. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

D. Install semirigid joint filler full depth in saw-cut joints and at least 1 deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.17 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 033000

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry-joint reinforcement.
5. Ties and anchors.
6. Embedded flashing.
7. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry furnished under Section 05 12 00 "Structural Steel Framing".
2. Steel brick shelf angles, brick relieving angles and hung lintels anchored to masonry walls, furnished under Section 05 12 00 "Structural Steel Framing"
3. Loose steel lintels, furnished under Section 05 12 00 "Structural Steel Framing"
4. Anchor rods and embed plates indicated to be built into masonry, furnished under Section 05 12 00 "Structural Steel Framing"
5. Cavity wall insulation.

C. Related Requirements:

1. Section 03 33 00 "Cast-in-Place Concrete" for reinforcing steel dowels for anchoring concrete unit masonry to cast-in-place concrete.
2. Section 05 12 00 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 07 21 00 "Thermal Insulation" for cavity wall insulation.
4. Section 07 62 00 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 ALLOWANCES

1.4 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product, including but not limited to:
   1. Single Wythe Masonry Joint reinforcement
   2. Mutliwythe Composite Masonry Joint reinforcement
   3. Multiwythe Cavity Wall Joint Reinforcement
   4. Rigid Anchors

B. Shop Drawings: For the following:

   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
      a. Show elevations of all reinforced walls including reinforcing per typical details for all openings including but not limited to openings for ductwork and piping.
      b. Dowels shall match typical wall reinforcing unless noted otherwise.
      c. Dowels shall extend a lap distance above finished floor, unless top of footing is more than typical bar lift below finished floor. In such an instance dowel shall extend a lap distance out of footing.
      d. Coordinate bar lift detailing with sequencing requirements of part 3 of this specification section.
      e. Layout cmu control joints per contract documents and show associated typical reinforcing.
      f. General Contractor shall coordinate all necessary openings in masonry walls with all subcontractors and shall provide information to reinforcing steel detailer for preparation of shop drawings.
      g. Where above the ceiling coordination drawings are a project requirement the coordination drawings shall be provided to the reinforcing steel detailer to aid in developing elevation of reinforced walls.
   3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Verification: For each type and color of the following:

   1. Concrete Masonry Units.
   2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
   3. Accessories embedded in masonry.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor’s Statement of Responsibility Per Division 01 Section "014000 – Quality Requirements”.

B. Qualification Data:
   1. Testing agency.
   2. Post Installed Anchor Installer

C. Material Certificates: For each type and size of the following:

1. Masonry units.

    a. Include data on material properties.
    b. Include size-variation data verifying that actual range of sizes falls within specified tolerances.
    c. For exposed masonry, include test report for efflorescence according to ASTM C 67.

2. Cementitious materials. Include name of manufacturer, brand name, and type.
3. Mortar admixtures.
4. Reinforcing bars.
5. Anchors, ties, and metal accessories.
6. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
7. Preblended Grout mixes. Include description of type and proportions of ingredients.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Concrete Masonry Units.
    a. Submit material test reports for each type of mix to be use in production of block for the project.
    b. Submit material test reports not more than 180 days old demonstrating compliance with the specified ASTM standards and project requirements.
2. Concrete Masonry Unit Aggregates: For concrete masonry units containing recycled material or post-industrial waste for aggregates provide test reports in accordance with the quality assurance requirements below.
3. Mortar Aggregates
4. Mortar Cementitious Materials
5. Grout Fine Aggregates (for field mixed grout only)
6. Grout Course Aggregates (for field mixed grout only)
7. Grout Cementitious Materials (for field mixed grout only)

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Grout: For each type of grout
    a. Indicate amounts of mixing water to be withheld for later addition at Project site.
    b. Mix design submittals shall include test results and/or trial batch data that meet or exceed the required average compressive strengths required by ACI 301. In accordance with ASTM C476 all testing shall be completed per ASTM C1019.
    c. Trial batches shall consist of identical cementitious materials, fine and course aggregates, and admixtures to be used for mix design.
    d. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
2. Mortar: For each type of mortar
    a. Indicate materials to be used
    b. Indicate proportioning of ingredients.
    c. Indicate repeatable means of measuring ingredient proportions.
    d. When using the ASTM C270 property specification include test reports. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.

F. Research/Evaluation Reports:
1. Post installed structural anchors: See specification section 05 05 20

G. Hot and Cold Weather Program: Describe in detail procedure for working in Hot and Cold Weather. Included detailed description of methods, materials, and equipment to be used to comply with requirements.

H. QUALITY ASSURANCE

I. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

J. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.

1. Build sample panels for typical exterior wall in sizes approximately 48 inches long by 48 inches high by full thickness.
2. Build sample panels facing south.
3. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
4. Clean one-half of exposed faces of panels with masonry cleaner indicated.
5. Protect approved sample panels from the elements with weather-resistant membrane.
6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

    a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

K. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for typical exterior wall in sizes approximately 72 inches long by 60 inches high by full thickness, including face and backup wythes and accessories.

    a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
    b. Include lower corner of window opening, framed with stone trim, at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
    c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
    d. Include metal studs, sheathing, water-resistive barrier sheathing joint-and-penetration treatment, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.

3. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
4. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
5. Protect accepted mockups from the elements with weather-resistant membrane.
6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

    a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

7. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion

L. Post Installed Structural Anchor Installer: See specification section 050520 for requirements.

M. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

N. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

O. Limitations on Aggregates: For concrete masonry units containing recycled material or post-industrial waste, provide units free of impurities that will cause rusting, staining or popouts and with a record of successful in-service performance in conditions similar to those expected at Project site.
1. Ferrous material shall be removed by magnetic separation.
2. Aggregates shall contain no combustible materials.
3. Aggregates shall be graded and supplied in consist graduations from batch to batch.
4. Material shall be tested according to the following:
   a. ASTM C40: Organic Impurities in Fine Aggregates for Concrete.
   b. ASTM C 136: Sieve Analysis of Fine and Coarse Aggregate.
   c. ASTM C 641: Staining Materials in Lightweight Concrete Aggregates.
   d. ASTM C 151: Autoclave Expansion of Hydraulic Cement (for popouts.)

P. Grout Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design grout mixtures.

Q. Daily Log: Maintain a daily log of masonry work in progress for inspection by Owner, Architect, Special Inspector or Authority Having Jurisdiction.
1. Indicate on small scale plans where masonry was erected.
2. Indicate on small scale plans where masonry was grouted.
3. Identify crew and assigned work area.
4. Certify that the following tasks have been performed.
   a. Inspection of construction and verification of compliance with requirements as indicated in schedule of special inspections.
   b. Daily Cleaning.

R. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

S. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
1. Review construction sequencing and required time allotted for inspections prior to grouting.
2. Review TMS 602 tolerance for placement of reinforcing steel.
3. Review hot and cold weather procedures.
4. Review typical details for reinforcement requirements
5. Review requirements for horizontal joint reinforcement
6. Review reinforcement placement tolerance
7. Review reinforcement anchorage requirements
8. Review reinforcement lap requirements
9. Review reinforced masonry construction sequence

10. Review limits on embedded items in grouted masonry
11. Review grouting procedures and requirement for mechanical vibration.
12. Review requirements for masonry protection

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
2. Where one wythe of multi wythe 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 three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

2.3 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, bond beams and other special conditions.
2. Provide square edge units at outside corners of exterior units unless otherwise indicated.
3. Provide bullnose units for all outside corners of interior units scheduled to be painted. except as follows:
   a. First course at finished floor
4. Provide bullnose units for sills unless otherwise indicated

B. Color and finish:
1. Color and finish of all exterior units exposed to view shall match Architect’s sample.
2. Manufacturer’s standard color and finish shall be used for all interior units scheduled to be painted.

C. Cell Layout:
1. All block shall be of standard two cell or open end configuration.
2. All block shall be configured such that it allows for both of the following:
   a. Placement of reinforcing as indicated with not less than 1/2" clear grout cover between the bar and the block.

b. For the required bonding pattern the block will provide a minimum 3 inch by 3 inch continuous vertical column to receive grout.

D. CMU: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Density Classification: Lightweight unless noted otherwise
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

2.4 MASONRY LINTELS

A. Masonry Lintels: Unless indicated otherwise provide built-in-place masonry lintels made from lintel or channel concrete masonry units for the bottom course, and bond beam units for additional courses indicated with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured. CMUs shall match adjacent CMUs in color, texture, and density classification. Temporarily support built-in-place lintels until cured.

2.5 MORTAR AND GROUT MATERIALS

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

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

B. Mortar Cement: ASTM C 1329.

C. Masonry Cement: Not Permitted

D. Hydrated Lime: ASTM C 207, Type S.

E. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

F. Colored Cement Products: Packaged blend made from and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Colored Portland Cement-Lime Mix:

a. Products: Subject to compliance with requirements, provide one of the following:

1) Essroc; Riverton Portland Cement Lime Custom Color.
2) Holcim (US) Inc; Rainbow Mortamix Custom Color Cement/Lime.
3) Lehigh Hanson; HeidelbergCement Group; Lehigh Custom Color Portland/Lime Cement.

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments shall not exceed 10 percent of portland cement by weight.
4. Pigments shall not exceed 5 percent of masonry cement by weight.

G. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

H. Aggregate for Grout: ASTM C 404.

I. Water: Potable.

J. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

2.6 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Mill- Hot-dip galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon Stainless steel.
3. Wire Size for Side Rods: 0.148-inch 0.187-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch 0.187-inch diameter.
5. Wire Size for Veneer Ties: 0.148-inch 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet.

D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

E. Masonry Joint Reinforcement for Multiwythe Cavity Wall Masonry:
1. Adjustable (two-piece) type, ladder design
2. One side rod at each face shell of backing wythe
3. Separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
4. Tie Section:
    a. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
    b. Provide rectangular units with closed ends and not less than 4 inches wide.

2.7 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M. Hot-dip galvanized to comply with ASTM A 153/A 153M

C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inchcover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer or anchored masonry.

D. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication stainless steel.

E. Rigid Anchors: Fabricate from ASTM A 36 steel bars 1-1/2 inches wide by 1/4 inchthick by length required, with ends turned up 2 inches. Hot-dip galvanized to comply with ASTM A 153/A 153M

2.8 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with and as follows:

1. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
5. Fabricate through-wall flashing with sealant stop unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
6. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
7. Solder metal items at corners.

B. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Copper-Laminated Flashing: 5-oz./sq. ft. copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Advanced Building Products Inc.; Copper Fabric FlashingCopper Sealtite 2000.
2) Hohmann & Barnard, Inc; Copper Fabric Flashing.
3) York Manufacturing, Inc; Multi-Flash 500.

C. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.

3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge or flexible flashing with a metal drip edge.
4. Where flashing is fully concealed, use metal flashing or flexible flashing.

D. Termination Bars for Flexible Flashing: Stainless-steel sheet 0.019 inch by 1-1/2 inches with a 3/8 inch sealant flange at top.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.

B. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

C. Weep/Cavity Vent Products: Use the following unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Advanced Building Products Inc.; Mortar Maze Cell Vent.
2) Heckmann Building Products, Inc.; No. 85 Cell Vent.
3) Wire-Bond; Cell Vent.

D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Advanced Building Products Inc.; Mortar BreakMortar Break II.
b. CavClear/Archovations, Inc.; CavClear Masonry Mat.
c. Mortar Net USA, Ltd; Mortar Net.

2. Configuration: Provide one of the following:

a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.

E. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

F. Vertical Reinforcing Bar Positioners: Custom fabricated wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding vertical reinforcing bars in proper location of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication.
1. Provide units with two loops for masonry walls indicated to have a single vertical reinforcing bar at each grout spacing.
2. Loop layout shall allow for placement of vertical reinforcing in center of cmu wall thickness unless noted otherwise

3. Provide units with four loops or a pair of units with two loops for masonry walls indicated to have two vertical reinforcing bars at each grout spacing.
4. Provide custom fabricated positioners with loop layout to allow for placement of vertical reinforcing as indicated in the contract documents.

G. Horizontal Reinforcing Bar Positioners: Custom fabricated wire units designed to fit into mortar bed joints spanning masonry unit cells and bent down for holding horizontal reinforcing bars at proper height in lintels and bond beam. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication.
1. Provide custom fabricated positioners to allow for placement of horizontal reinforcing in lintels as indicated in the contract documents.
2. Positioners for continuous bond beams shall center reinforcing in the depth of the bond beam unit unless noted otherwise.

2.10 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.

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Preblended, Dry Grout Mix: Furnish dry grout ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

D. Mortar for Unit Masonry: Provide "Type S" mortar complying with ASTM C 270, Proportion or Property Specification unless indicated otherwise.

E. Pigmented Mortar: Use colored cement products.

1. Pigments shall not exceed 5 percent of mortar cement by weight.
2. Mix to match Architect's sample.
3. Application: Use pigmented mortar for exposed mortar joints with the following units:

a. Concrete Masonry Units Exposed to view.

F. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 as follows:
   a. 28-day compressive strength of 3000 psi unless noted otherwise.
   b. Provide grout with a slump of 8 to 11 as measured according to ASTM C 143/C 143M.
3. Ready-Mixed Grout: Measure, batch, mix, and deliver grout according to ASTM C 476, and furnish batch ticket information.

   a. Slump shall be adjusted on site as necessary, and grout shall be re-mixed at mixing speed for at least one minute before discharging to achieve the desired consistency.
4. Project-Site Mixed Grout: Mix preblended, dry grout mix according to ASTM C 476.
   a. Mix in a mechanical mixer for a minimum of 5 minutes with sufficient water to achieve the desired consistency.
   b. Hand mixing of grout is not permitted
   c. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that impair mortar bond.
5. Verify that foundations are "broom" clean and free of debris or other laitance that may compromise mortar bond.

B. Before installation, examine rough-in and built-in construction for electrical, mechanical, piping and other systems to identify locations of built in construction.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

   1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
   2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
   3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

   1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
   3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
   4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
   5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
   6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.
   7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

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

5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

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

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Reinforced Masonry: Keep vertical cells aligned to maintain continuous unobstructed cells not less than 3 inches by 3 inches to receive reinforcing steel and grout.

E. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

F. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

G. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

I. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

J. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, leaving a minimum 1” clearance between masonry and structure above unless otherwise indicated.
1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1 inch clearance between end of anchor rod and end of tube. Space anchors 32 inches o.c. unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. General: Prepare mortar in accordance with current Portland Cement Association publications.

B. Prepare fresh mortar at the rate it will be used, in order to maintain consistent color and workability. Do not use mortar that has stiffened because of hydration. Discard when not used within the time recommended by mortar manufacturer or PCA publications, whichever is shorter. Retemper mortar carefully to avoid color changes, no more than twice per batch.

C. Measure mortar materials using cubic foot measuring box or other approved container of known volume, of size appropriate for operation. Use a consistent ratio of water to mortar materials, within the range recommended by the mortar manufacturer's written instructions.

D. Lay hollow CMUs as follows:
1. Only lay cmu on foundations after they have achieved a "broom" clean condition and are free of debris or other laitance that may compromise mortar bond.
2. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
3. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
4. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
5. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
6. With head joints filled to a minimum thickness equal to the face shell of the unit on both faces of the unit.

E. 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.

F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

G. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

H. Cut joints flush where indicated to receive cavity wall insulation or air barriers unless otherwise indicated.

I. Immediately after placing a course of masonry clean mortar drippings and fins from cells to receive reinforcing. Care shall be taken to collect the loose material and remove it from the cell and not allowing it to collect at the bottom of the cell.

3.6 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to cmu wall backing as follows:
1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
a. Use adjustable (two-piece) type reinforcement to allow for differential movement regardless of whether bed joints align.

3.7 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:
   1. Install preformed control-joint gaskets designed to fit standard sash block.

C. Form expansion joints in brick as follows:

   1. Build in compressible joint fillers where indicated.
   2. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 07 92 00 "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 92 00 "Joint Sealants," but not less than 3/8 inch.

   1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 LINTELS

A. Install steel lintels where indicated.

B. Built in Place Lintels:
   1. Provide lintels where shown and where openings of more than 12 inches for block-size units are shown without structural steel or other supporting lintels.
   2. Construct from closed bottom lintel or channel concrete masonry units for the bottom course with reinforcing steel placed as indicated, supported on positioners and anchored in place. Bond beam units are not permitted for bottom course.
   3. Provide bond beam units for additional courses indicated with reinforcing steel placed as indicated supported on positioners and anchored in place.
   4. Fill the entire depth and length of the lintel grout in one grout pour. Grout joints are not permitted in lintels.
   5. Temporarily support built-in-place lintels until cured.
   6. Provide minimum bearing of 16 inchesat each jamb unless otherwise indicated.

3.10 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602 and as follows:

1. Center all vertical reinforcing steel on the thickness of the concrete masonry unit unless noted otherwise.
2. Bar positioners must be anchored in place with mortar.
3. Sequencing:
    a. Reinforcing steel from previous grout lift extends a lap distance out of hardened grout.
    b. No additional reinforcing is placed, and additional masonry is laid up, but not exceeded the grout pour height limit.
    c. Reinforcing bar positioner is placed in the bed joint of the second course of additional masonry, and below the last bed joint of additional masonry with additional bar positioners installed such that spacing does not exceed 48 inches on center
    d. The cells of additional masonry are cleaned of mortar droppings and mortar fins.
    e. A lift of reinforcing steel is dropped into the previously laid masonry using the bar positioners to ensure proper location. The reinforcing steel shall extend above the proposed grout pour height by a minimum of one splice distance.
    f. The grout lift is placed and consolidate.
    g. The sequence is repeated.
4. Where a reinforced cell is noted to have the vertical reinforcing offset from the center of the concrete masonry unit then provide special two loop bar positioners to locate each vertical bar and the associated splice bar per the contract documents.
    a. Alternately a two loop bar positioner may be installed rotated parallel to the face shells to locate the vertical bar and the associated splice bar per the contract documents.
5. Where a reinforced cell is noted to have two vertical bars provide special four loop bar positioners to locate each vertical bar and the associated splice bar per the contract documents.
    a. Alternately a pair of two loop bar positioners may be installed rotated parallel to the face shells to locate each vertical bar and the associate splice bar per the contract documents.
6. A minimum of 1” clear shall be maintained between pairs of parallel bars occurring in the same vertical cell, lintel or bond beam.
7. A minimum of 1” clear shall be maintained between vertical bars or pairs of vertical bars and , piping or other embeds occurring in the same vertical cell.
8. A minimum of ½” shall be maintained between any reinforcing bar and the adjacent masonry unit.
9. Wet setting of reinforcing steel into previously placed grout is not permitted.

C. Conduits, Piping, Panels, Boxes and other Embedded Equipment
1. The maximum outside diameter of any vertical conduit or piping located in a grouted cell shall be as follows:
    a. 1.5 inches for 12 inch cmu
    b. 1.125 inches for 8 inch cmu
    c. 1 inch for 6 inch cmu
    d. Where vertically reinforced and grouted cells are not specifically located in the contract documents it is acceptable to relocate the vertically reinforced and grouted cell to the next adjacent cell to avoid a conduit or pipe of larger dimension than permitted. The typical center to center spacing of vertically reinforced and grouted cells shall be maintained.
    e. Where vertically reinforced and grouted cells are specifically located in the contract documents, conduit or pipes of dimensions larger than permitted shall be routed to avoid the vertically reinforced and grouted cells. In the case that the conduit or piping cannot be routed to avoid the vertically reinforced and grouted cell the Engineer shall be contacted for resolution.
2. Horizontal runs of conduit or pipe are not permitted in within lintels or bond beams
3. Horizontal runs of conduit or pipe passing through vertically reinforced and grouted cells are not permitted.
4. Piping containing either of the following shall not be located in grouted masonry:

a. Liquid, gas or vapors at temperatures higher than 150 degrees Farenheit
b. Under pressures in excess of 55 psi
c. Containing water or other liquids when they are subject to freezing

5. Inset panels, boxes, fire extinguisher cabinets and other embedded items are not permitted in grouted cells.
   a. Where vertically reinforced and grouted cells are not specifically located in the contract documents it is acceptable to relocate the vertically reinforced and grouted cell to the next adjacent cell to avoid conflict with embedded equipment. The typical center to center spacing of vertically reinforced and grouted cells shall be maintained.
   b. Where vertically reinforced and grouted cells are specifically located in the contract documents and conflict with embedded equipment, the embedded equipment shall be surface mounted or relocated as allowed by the contract documents. Where contract documents do not allow for surface mounting or relocating the equipment the Engineer shall be contacted for resolution.

D. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Prior to grouting all grouted cells shall be inspected to ensure cells are free of loose mortar droppings or debris.
      a. All debris and mortar droppings shall be removed.
      b. All hardened mortar or mortar fins protruding more than 1/2 inch into cell shall be removed.
   2. Comply with requirements in TMS 602 for grout properties and minimum grout space.
   3. Limit height of vertical grout lifts and grout pours to not more than 60 inches.
   4. Grout all courses of lintels and beams in one continuous operation for the full height of the lintel or beam. Do not allow cold joints in lintels and beams.
   5. Grout lifts shall be terminated at top of walls shall be carefully consolidated to ensure grout is cured flush to top of masonry, and provides solid bearing beneath all bearing plates.
   6. Grout lifts terminating at bond beams, except at top of wall shall stopped 1/2" down from top of bond beam
   7. Typical grout lifts, not terminating at bond beam or top of wall shall be terminated a minimum of 1 1/2", but not more than 3" below a bed joint.
   8. All grout lift terminations shall be coordinate with reinforcing steel layout to ensure proper lap distance of reinforcing steel. Grout pours shall not be terminated anywhere along the length of the splice.
   9. All grout shall consolidated using internal vibration with a pencil type vibrator.
      a. Consolidate grout in each cell or bond beam immediately after placement. Top of bond beam or cell to desired height after initial consolidation.
      b. Reconsolidate grout in each cell or bond beam after initial water loss and settlement has occurred approximately 10 minutes after initial consolidation. Top of bond beam or cell to desired height after reconsolidation.

3.11 FLASHING, WEEP HOLES, AND CAVITY 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. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, 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.

2. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under water-resistive barrier, lapping at least 4 inches. Fasten upper edge of flexible flashing to sheathing through termination bar.
3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
4. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products to form weep holes.
2. Use wicking material to form weep holes above flashing under masonry sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches o.c. unless otherwise indicated.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

F. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.12 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports in accordance with the schedule of special inspsections. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

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

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Clean masonry by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
4. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
5. Clean stone trim to comply with stone supplier's written instructions.

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal: Remove all masonry waste and legally dispose of off Owner's property.

END OF SECTION 04 20 00

SECTION 050520 - POST INSTALLED STRUCTURAL ANCHORS

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. Wedge anchors
2. Cartridge injection adhesive anchors

B. This specification section is only intended for use when specifically required by the drawings or other referencing specifications and structural applications. This section is not intended for use in non-structural applications or where not specifically referenced by the drawings or other specification sections.

C. Related Sections include the following:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Structural Steel Framing" for anchorage of structural steel.
3. Division 06 Section "Rough Carpentry" for anchorage of wood framing

1.3 PERFORMANCE REQUIREMENTS

A. The basis of design products are as specified in this specification or the contract documents. Product substitutions must have capacities equal to or greater than values calculated for each specific condition calculated when calculated using the data in the referenced ESR report and in accordance with the appropriate design procedure and standards required by the building code. See requirements for substitution submittals.

1.4 DEFINITIONS

A. Post Installed Structural Anchors: Anchors supporting and/or anchoring structural elements of the building which are installed into hardened concrete or masonry and that are specified in the contract documents or performance based shop drawing design submittals for structural elements.

B. Wedge Anchors: A torque-controlled anchor, with an integral cone expander and single piece steel expansion clip providing 360-degree contact with the base material while not requiring oversized holes for installation and an impact section to prevent thread damage with required nuts and washers.

C. Cartridge Injection Adhesive Anchors: An anchor system consisting of rod insert, nut, washer and a cartridge type, two-component polymer or hybrid mortar adhesive system dispensed and mixed through a static mixing nozzle supplied by the manufacturer.

1.5 SUBMITTALS

A. Contractor’s Statement of Responsibility Per Division 01 Section "Collective Inspections and Structural Testing"

B. Product Data:

1. Wedge Anchors
2. Cartridge Injection Adhesive Anchors

C. Research/Evaluation Reports:

1. Submit ICC reports for the following:

a. Wedge Anchors
b. Cartridge Injection Adhesive Anchors

D. Substitutions:

1. Substitution requests may only be made using products with ICC-ESR reports for the product in the specific substrate.
2. Substitution request shall include signed and sealed calculations demonstrating that the product is capable of providing equivalent performance of the specified product for each specific location and condition when calculated using the data in the referenced ESR report and in accordance with the appropriate design procedure and standards required by the building code.
3. Substitution request shall specify the diameter and embedment depth of the substituted product
4. Any increase in material labor cost resulting from the substitution shall be the responsibility of the contractor.

E. Manufacturer's Instruction: Manufacturer's Installation Instructions

F. Qualification Data: Submit installer qualification data as stated in Quality Assurance section. Qualifications shall be submitted in a letter format for each type of anchor to be installed, and shall include the following:

1. The specific product to be used
2. Complete description of installation procedure
3. Personnel to be trained on anchor installation
4. Date of Manufacturer training
5. Manufacturer's training certificates or letter from manufacturer certifying training was complete with a list of individuals that were trained.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

a. Coordinate meeting with individual preinstallation conferences for the following
b. Structural Steel Framing
c. Cold-Formed Metal Framing
d. Rough Carpentry

B. Installer Qualifications: The installer shall be experienced in installing anchors equal to type, and into the substrate material required for this project

C. Installer Training: Conduct a thorough training session with the manufacturer's representative. Each individual responsible for the installation of anchors shall attend the training session. Training shall consist of a review of the complete process for the installation of the anchors and the use of proper equipment for drilling and installing the anchors, to include but not limited to:

1. Hole drilling procedure. Clarify acceptability of rotary hammer drilling and/or core drilling.
2. Hole drilling equipment
3. Type and diameter of drill bits
4. Hole preparation and hole cleaning technique
5. Hole cleaning equipment
6. Adhesive injection technique
7. Adhesive injection equipment
8. Anchor rod, nut and washer material requirements and associated cleaning requirements
9. Anchor and Anchor rod installation
10. Anchor tightening
11. Adhesive curing requirements

D. Certifications: All anchors shall have an ICC ESR Evaluation report indicating conformance with the current applicable Acceptance Criteria for the building code applicable to the project.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Keep anchors, rod materials, nuts and washers in manufacturer's packaging with label intact until needed for use.

B. Keep anchors free of dirt and debris.

C. Store anchors in a clean dry area

D. Protect anchors from corrosion and deterioration.

E. Store anchors and adhesives in strict accordance with manufacturer's requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nuts: Having a proof load stress equal or greater than the minimum tensile strength of the associated anchor where type and strength is not specifically indicated by anchor or adhesive manufacturer.

B. Washers: Of type and material compatible with nuts unless specifically indicated by anchor or adhesive manufacturer.

C. Plate Washers: Provide ASTM A 36 plate washers of size and configuration specifically indicated.

2.2 CORROSION RESISTANCE

A. Anchors and Anchor Bodies

1. Uncoated Carbon Steel: Carbon steel anchors uncoated and free from oil, lubricants and other deleterious substances.Acceptable for use as follows:

a. Interior dry conditions

2. Zinc Plated: Zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1) Acceptable for use as follows:

    a. Interior dry conditions

3. Hot Dip Galvanized: Carbon steel anchors with hot-dipped galvanized in accordance with ASTM A 153. Acceptable for use as follows:

    a. Interior dry conditions
    b. Exterior conditions
    c. Anchoring galvanized steel elements

4. Stainless Steel: AISI Type 316 stainless steel and complying with ASTM F 593. Acceptable for use as follows:

    a. Anchoring treated lumber elements
    b. Anchoring stainless steel elements
    c. Anchoring aluminum elements or in contact with aluminum elements.

B. Nuts

1. Uncoated carbon steel: Acceptable for use as follows:

    a. With Uncoated Anchors

2. Hot Dip Galvanized: Hot-dipped galvanized in accordance with ASTM A 153. Acceptable for use as follows:

    a. With Zinc Plated Anchors
    b. With Hot Dip Galvanized Anchors

3. Stainless Steel: ASTM F594. Acceptable for use as follows:

    a. With Stainless Steel Anchors

C. Washers

1. Uncoated carbon steel: Acceptable for use as follows:

    a. With uncoated anchors

2. Hot Dip Galvanized: Hot-dipped galvanized in accordance with ASTM A 153. Acceptable for use as follows:

    a. With Hot Dip Galvanized Nuts

3. Stainless Steel: AISI Type 316 stainless steel. Acceptable for use as follows:

    a. With Stainless Steel Nuts

D. Plate Washers:

1. Uncoated carbon steel: Acceptable for use as follows:

    a. With Uncoated Nuts

2. Hot Dip Galvanized: Hot-dipped galvanized in accordance with ASTM A 153. Acceptable for use as follows:

a. With Hot Dip Galvanized Nuts

2.3 WEDGE ANCHORS

A. Provide anchors with length identification markings conforming to ICC-ES AC01 or ICC-ES AC193 as appropriate based on the anchor substrate..

B. Size: As indicated on drawings

C. Embedment depth: As indicated on the drawings but not less than the manufacturer's documented minimum embedment depth. Where not specifically indicated use manufacturer's minimum documented embedment depth.

1. Embedment depth is from surface of concrete or masonry. Anchor lengths and extent of threads shall account for embedment depth, connected elements, plate washers, washers, nut and appropriate stick thru.

D. Concrete Anchors:

1. Anchors shall be tested in accordance with ACI 355.2 and the most recent issue of ICC-ES AC193 including the following:

a. All mandatory testing
b. Shear and tension in cracked concrete.
c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with ACI 318 Chapter 17
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

a. Hilti Kwik Bolt TZ with nut and washer, of required finish, ICC ESR-1917
b. Approved equal (See substitution requirements)

E. Masonry Anchors:

1. Anchors for masonry shall be tested in accordance with most recent edition of ICC-ES AC01 including the following

a. All mandatory testing
b. Seismic tension and shear
c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with ACI 530
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

a. Hilti Kwik Bolt 3 with nut and washer, of required finish, ICC ESR-1385.
b. Approved equal (See substitution requirements)

2.4 CARTRIDGE INJECTION ADHESIVE ANCHORS

A. Provide anchors with length identification markings conforming to ICC-ES AC58 or ICC-ES AC308.

B. Size: As indicated on drawings

C. Embedment depth: As indicated on the drawings but not less than the manufacturer's documented minimum embedment depth. Where not specifically indicated use manufacturer's minimum documented embedment depth.

1. Embedment depth is from surface of concrete or masonry. Anchor lengths and extent of threads shall account for embedment depth, connected elements, plate washers, washers, nut and appropriate stick thru.

D. Adhesive: Two component epoxy or two component hybrid system.

E. Concrete Anchors:

1. Anchors shall be tested in accordance with the most recent issue of ICC-ES AC308 including the following:

    a. All mandatory testing
    b. Shear and tension in cracked concrete.
    c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with ACI 318 Chapter 17 as amended by the specific design provisions of ICC-ES AC308
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

    a. Rods, washers, and nuts of required finish with Hilti HIT RE 500 V3 Adhesive Anchorage System for anchorage to concrete, ICC ESR-3814.
    b. Rods
        1) Carbon Steel Rods: ASTM A193 B7 coated as required for use
        2) Stainless Steel Rods: ASTM F593, CW

    c. Approved equal (See substitution requirements)

4. Where Hilti HIT-HY 200, ICC ESR-3187 system is specifically indicated in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

    a. For anchors 3/8" to 3/4" diameter: HIT-Z Standard or HIT-Z-R SS rods, washers, and nuts of required finish.
    b. Approved equal (See substitution requirements)

F. Masonry Anchors:

1. Anchors for masonry shall be tested in accordance with most recent edition of ICC-ES AC58 including the following

    a. All mandatory testing
    b. Seismic tension and shear
    c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with ACI 530
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

    a. Grouted Masonry: HAS-E Standard or HAS SS rods, washers, and nuts of required finish with Hilti HIT HY 270 Adhesive Anchorage System for anchorage to masonry, ICC ESR-4143.

    b. Approved equal (See substitution requirements)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.
2. Installation constitutes acceptance of existing conditions and responsibility of satisfactory performance.

3.2 INSTALLATION, GENERAL

A. Corrosion Resistance: Care shall be taken to ensure an anchor and associated accessories of the proper material and associated corrosion resistance are used for the specification application. See corrosion resistance requirements above.

B. Where manufacturer recommends the use of special tools for installation of anchors, such tools shall be used.

C. Match mark and drill, match drill or use other methods to ensure anchors are properly located.

D. Do not adjust anchor location after installation. Coordinate with EOR for modifications to connected element where anchors are incorrectly located.

E. All facets of hole drilling, hole cleaning, anchor installation, anchor torqueing shall be in strict accordance with the ICC-ESR report and manufacturer's data.

F. Drill holes perpendicular to substrate surface.

G. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits as indicated in the ICC-ESR report.

H. Drill bits and core bits shall be of diameters indicated in the ICC-ESR report.

I. All holes shall be cleaned with compressed air to remove all drilling dust and other deleterious substances.

J. Remove water from holes to attain a surface dry condition unless specifically permitted otherwise by ICC-ESR report.

K. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

L. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.

M. Perform anchor installation in strict accordance with manufacturer instructions and ICC-ES report.

N. Anchors shall be installed perpendicular to the substrate face within plus or minus 5 degrees unless specifically permitted otherwise by ICC-ESR report.

O. Install plate washers where specifically indicated or where connected elements have oversized holes.

P. Install a round washer under nuts. Round washers are in addition to plate washers where plate washers are required.

3.3 WEDGE ANCHORS

A. Protect threads from damage during anchor installation.

B. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10% of the specified torque, 100% of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Engineer.

3.4 CARTRIDGE INJECTION ADHESIVE ANCHORS

A. Clean all holes per manufacturer instructions using manufacturer's approved tools to remove loose material and drilling dust prior to installation of adhesive.

B. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

C. Follow manufacturer recommendations to ensure proper mixing of adhesive components.

D. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface.

E. Remove excess adhesive from the surface.

F. Shim anchors with suitable device to center the anchor in the hole.

G. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

H. Observe manufacturer recommendations with respect to installation temperatures.

I. Hilti HIT-HY200 system anchors shall be installed using the Hilti Safe Set Technology.

1. For conditions using HAS rods the Hilti hollow drill bit and Hilt vacuum system shall be employed.

3.5 FIELD QUALITY CONTROL

A. Testing and Inspection: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

B. Galvanizing Repairs: Prepare and repair damaged galvanized coatings with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 050520

SECTION 051200 - STRUCTURAL STEEL FRAMING

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. Architecturally Exposed Structural Steel
3. Embed Plates
4. Bearing Plates
5. Loose Lintels
6. Brick Shelf Angles, Brick Relieving Angles and Hung Lintels anchored to masonry walls
7. Nonshrink Grout.

B. Products furnished, but not installed under this Section:

1. Loose Steel Lintels, installed under Division 04 Section "Concrete Unit Masonry"
2. Brick Shelf Angles, Brick Relieving Angles and Hung Lintels anchored to masonry walls and associated anchors, installed under Division 04 Section "Concrete Unit Masonry"
3. Anchor rods with setting templates and embed plates indicated to be built into masonry, installed under Division 04 Section "Concrete Unit Masonry".
4. Anchor rods with setting templates and embed plates indicated to be cast into cast-in-place concrete, installed under Division 03 Section "Cast-in-place-Concrete"

C. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Post Installed Structural Anchors" for wedge, and adhesive anchors
3. Division 09 painting Sections and Division 09 Section "High-Performance Coatings" for special surface-preparation and priming requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges" and as modified herein.

B. Architecturally Exposed Structural Steel (AESS): Structural steel designated as architecturally exposed structural steel in the Contract Documents.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360

1.5 SUBMITTALS

A. Contractor's Statement of Responsibility Per Division 01 Section "Collective Inspections and Structural Testing"

B. Fabricator's Certificate of Compliance Per Division 01 Section "Collective Inspections and Structural Testing"

C. Quality Control Plan: Job specific Quality Control Plan for Fabricator, Erector including qualification data for the following:

1. Fabricator
   a. Testing personnel.
   b. Inspection personnel
2. Erector
   a. Inspection personnel

D. Weekly Inspection reports for Shop Fabricated Steel

E. Nonconformance reports for Shop Fabricated Steel

F. Product Data:

1. Primers

2. Paints
3. Electrodes

   a. Indicate what welding process will be used with each electrode
   b. Submit electrodes for both shop and field welding

4. Bolts, nuts, and washers including mechanical properties and chemical analysis.
5. Direct-tension indicators.
6. Tension-control, high-strength bolt-nut-washer assemblies.
7. Shear stud connectors.
8. Deformed bar anchors.
9. Nonshrink grout.
10. Post installed structural anchors: See specification section 050520

G. Shop Drawings: Show fabrication of structural-steel components.

1. All anchor rods shall be detailed with a minimum 3" projection above top of nut in the final installed condition unless noted otherwise.
2. Include min. 1/8" anchor rod setting templates. Detail quantity of templates such that there is one template for each bolt group. (Templates should not be reused).
3. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
4. Splice members where indicated in the contract documents and as required to facilitate fabrication and erection. Coordinate splice locations within the limitations of referenced standards subject to approval of the Engineer of Record.
5. Include embedment drawings showing plan location and elevation of all embedded items.
6. 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.
7. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
8. Include scale drawings of all gusset plates.
9. Provide minimum 1/4" thick cap plates at the ends of all exposed HSS members, and at the top of all HSS columns.

10. Equally space filler beams or joists between columns and/or other dimensioned beams unless noted otherwise.
11. Where delegated design submittals are required the delegated design submittal must be included with associated shop drawings or the submittal will not be reviewed.

H. Slip Critical Bolt Installation Statement: A written statement indicating the means and equipment to be used to achieve the tightening requirements for clip critical bolt installation. Statement shall identify the specific pre-installation required by the special inspections and acknowledge that this testing must be coordinated and completed prior to commencement of erection.

I. As-built anchor rod and embed survey

J. Welding certificates

1. Submit welding certificates for all individuals expected to be performing field welding

K. Welding Procedure Specifications (WPS's) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each field welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

L. Qualification Data:

1. Fabricator
2. Structural Steel Erector
3. Post Installed Structural Anchor Installer: See specification section 050520

M. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

N. Research/Evaluation Reports:

1. Post Installed Structural Anchors per specification section 050520

O. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Quality Control Plan: Each fabricator and Erector shall provide a job specific Quality Control plan.

1. The plan shall specifically identify all QC and QA inspections the fabricator and erector will be completing, the frequency of those inspections and the contractor's personnel and/or contractor's testing agency that will be completing the specific inspections.
2. AISC Code of Standard Practice
3. The plan shall comply with AISC 360-10 chapter N modified as follows:
   a. 100% UT of CJP groove welds without reduction.
4. The plan shall comply with AWS D1.1
5. The plan shall include any additional inspections or testing identified in the contract documents.

B. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU (Certified Building Fabricator) and which employs personnel or an independent testing agency that are qualified to complete all the required inspections and testing. Personnel shall be qualified as required by AWS D1.1 where completing weld testing and inspection.

C. Fabricator's Testing Agency (as required to supplement fabricator personnel): An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated. Personnel shall be qualified as required by AWS D1.1 where completing weld testing and inspection.

D. Structural Steel and Architectural Structural Steel Installer Qualifications: The erector shall be experienced in installing structural steel equal in material, design and scope to the structural steel required for this project.

E. Post Installed Structural Anchor Installer: See specification section 050520 for requirements

F. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

G. 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."

H. Preinstallation Conference: Conduct conference at Project site.

1. Review special inspection and testing and inspecting agency procedures for field quality control.
2. Review items requiring special inspection and testing that must be tested and inspected prior to installation of decking, concrete slabs, or other items that might limit access to the item to be tested or inspected
3. Review welding requirements
4. Review electrode storage requirements
5. Review pre-construction bolt installation verification
6. Review bolt installation calibration requirements

1.7 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.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation. Provide min. 1/8" thick setting template for anchor rods.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes and Tees: ASTM A 992.

B. Channels, Angles-Shapes:

1. ASTM A 36 unless noted otherwise
2. ASTM A 572/A 572M, Grade 50 where indicated.

C. Plate and Bar:

1. ASTM A 36 unless noted otherwise
2. ASTM A 572/A 572M, Grade 50 where indicated.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C, structural tubing.

1. Square or Rectangular HSS: Fy=50 KSI
2. Round HSS: Fy=46 KSI

E. Welding Electrodes:

1. Comply with AWS D1.1 requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM F 3125 GradeA325 or Grade A490 as indicated or as required, Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.

1. Finish:

a. Unprimed, Primed or painted steel: Plain
b. Hot Dip Galvanized Steel:

1) Bolts
a) Grade A325: ASTM F 2329 Hot-dip zinc coating
b) Grade A490: ASTM F1136 Grade 3 Zinc/Aluminum Coating

2) Nuts: ASTM F2329 Hot-dip zinc coating
3) Washers: ASTM F2329 Hot-dip zinc coating
4) Plate Washers: ASTM A123 Hot-dip zing coating

2. Direct-Tension Indicators (At Contractor's option for Pretensioned or Slip Critical Connections): ASTM F959, Type 325 or Type 490 corresponding to bolt type, compressible-washer type.

a. Finish:

1) Unprimed, Primed or painted steel: Plain
2) Hot Dip Galvanized Steel: Mechanically deposited zinc coating, ASTM B695, Class 50

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 3125 Grade F1852 or Grade F2280 as indicated or as required, Type 1, heavy hex or round head steel structural bolts with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish:

    a. Unprimed, Primed or painted steel: Plain
    b. Hot Dip Galvanized Steel: Not permitted.

C. Unheaded Anchor Rods

1. ASTM F1554 of Grade and associated supplements as indicated and as follows:

    a. Grade 36, Supplement S3
    b. Grade 55 with supplements S1 (weldable) and S3
    c. Grade 105 with supplement S3

2. Configuration: Straight.
3. Nuts: ASTM A 563 heavy hex carbon steel.
4. Plate Washers: ASTM A 36 carbon steel UNO, ASTM A 572 Grade 50 where indicated.
5. Washers: ASTM F 436 hardened carbon steel.
6. Finish:

    a. Unprimed, Primed or painted steel: Plain
    b. Hot Dip Galvanized Steel:

        1) Rod: ASTM F 2329 Hot-dip zinc coating
        2) Nuts: ASTM F2329 Hot-dip zinc coating
        3) Washers: ASTM F2329 Hot-dip zinc coating
        4) Plate Washers: ASTM A123 Hot-dip zing coating

D. Thread Studs: ASTM A 108, Grades 1015 through 1020, Full Threaded-stud type, cold-finished carbon steel; AWS D1.1, Type B.

E. Headed Stud Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

F. Deformed Bar Anchors (DBA's): AWS D1.1, Type “C”, ASTM A496 complying with ASTM A29 Grades 1010 through 1020.

G. Threaded Rods: ASTM A 36 unless noted otherwise.

1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Washers: ASTM A 36/A 36M carbon steel.
3. Finish:

    a. Plain for unprimed steel or steel receiving standard shop primer.
    b. Hot-dip zinc coating, ASTM A 153/A 153M, Class C for hot galvanized steel or steel to receive high performance top coating.

H. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

1. Finish:

    a. Plain for unprimed steel or steel receiving standard shop primer.
    b. Hot-dip zinc coating, ASTM A 153/A 153M, Class C for hot galvanized steel or steel to receive high performance top coating.

I. Post Installed Structural Anchors: See specification section 055020 for products

2.3 PRIMER

A. Standard Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

1. Typical all primed steel unless noted otherwise

B. Special Primer: Provide shop primer that complies with Division 09 [**painting Sections.**] [**Section "High-Performance Coatings"** as applicable**.**]

2.4 PAINT

A. Column Base Paint: A single component, self-priming cold applied Coal Tar Mastic suitable for corrosion protection of below grade steel.

1. Typical at column bases at exterior locations and/or as specifically noted on drawings.

B. Galvanizing Repair Paint: ASTM A 780.

2.5 NONSHRINK GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.

1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.

C. 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.

D. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Deformed Bar Anchors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of deformed bar anchors according to AWS D1.1/D1.1M and manufacturer's written instructions.

H. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

J. BUCKLING RESTRAINED BRACES

1. Splices in steel cores are not permitted
2. Assemble components of the BRB's in a manner to ensure proper performance of the brace.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop 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:

a. Snug tightened unless noted otherwise

B. Weld Connections:

1. Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

3. Architecturally Exposed Structural Steel: Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.

a. Grind butt welds flush.
b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.8 CLEANING

A. Clean and prepare faying surfaces in class "B" slip critical connections according to SPSC-SP6 "Commercial Blast Cleaning."

B. Clean and prepare steel surfaces in class "A" slip critical connections that are to remain unprimed according to SSPC-SP 2, "Hand Tool Cleaning" unless noted otherwise.

C. Clean and prepare steel surfaces that are to remain unprimed according to SSPC-SP 2, "Hand Tool Cleaning" unless noted otherwise.

D. Clean and prepare steel surfaces in class "A" slip critical connections that are to be primed according to SPSC-SP6, "Commercial Blast Cleaning."

E. Clean and prepare steel surfaces that are to receive standard primer according to SSPC-SP 3, "Power Tool Cleaning."

F. Clean and prepare steel surfaces that are to receive special primer according to the associated painting specification. When not specifically noted the minimum cleaning shall be SSPC-SP 6, "Commercial Blast Cleaning."

2.9 STANDARD PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Top flanges of beams to receive field welded headed studs

B. 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.

C. Stripe paint corners, crevices, bolts, welds, and sharp edges.

D. 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.

2.10 SPECIAL PRIMING:

A. All steel located in exterior spaces shall be shop primed per Division 09 Section ["High Performance Coatings","Exterior Painting"]

B. All steel located in interior spaces but to remain exposed shall be shop primed per Division 09 Section [Interior Painting]

C. All architecturally exposed structural steel in interior spaces shall be shop primed per Division 09 Section [Interior Painting]

D. All architecturally exposed structural steel located in exterior spaces shall be shop primed per Division 09 Section ["High Performance Coatings","Exterior Painting"]

E. Priming of steel noted as architecturally exposed structural steel shall be done with extreme care to avoid drips and runs.

2.11 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 will be exposed to the environment or that will be exposed in the finished work by plugging with zinc solder and filing off smooth.
2. Galvanize loose and hung lintels, shelf angles, all exposed exterior steel and all steel located in exterior masonry walls unless noted otherwise. Coordinate with drawings and specifications.

a. Galvanized elements to be top coated shall not be quenched, and shall be swept blast to ensure proper adhesion of top coats.

2.12 SOURCE QUALITY CONTROL

A. All source quality control and source quality assurance shall be completed by the fabricator's qualified personnel and/or the fabricator's qualified testing agency and shall be in accordance with the submitted and approved job specific quality control manual.

1. Additional weld inspections as noted herein or in the contract documents.
2. Payment for shop testing and inspection shall be the responsibility of the fabricator.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with 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 as-built survey of 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.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Where ungrouted anchor rod sleeves are required caulk the annular surface between the sleeve and the anchor rod to prevent grout from entering the sleeves.
2. Set plates for structural members on wedges, shims, or setting nuts as required. All shims shall be steel material.
3. Weld plate washers to top of baseplate as indicated.
4. Snug-tighten anchor rods after supported members have been positioned and plumbed.
5. Bearing plates and loose column base plates shall be grouted and cured prior to erecting the steel to be supported by the plate

6. Base plates attached to columns shall be grouted as soon as possible after the column has been plumbed. Base plates shall be grouted and cured before any elevated slabs are cast or before any column splices are made.
7. Prior to grouting all loose and latent material shall be removed from bearing surfaces and base or bearing plates. Concrete or masonry surfaces shall be broom clean. All shims or wedges shall be left in place and cut flush to the edge of the base or bearing plate.
8. Grout shall be placed 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 and curing instructions for shrinkage-resistant grouts.

    a. Use grout forms and grout surcharging as required to ensure that grout completely fills the space below bearing or base plate, and no voids remain.

9. Paint base plates, anchor bolts and sections of columns below grade and below finished floor with Coal Tar Mastic Paint when indicated on drawings.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Maintain erection tolerances of architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

E. 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 will be 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.

F. Splice members only where indicated on approved shop drawings.

G. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

H. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

I. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

1. For slip critical connections enlarge hole to next standard hole size and provide next standard bolt size.

J. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

K. Shelf Angles anchored to steel frame:

1. Sequencing of shelf angle installation shall be as indicated in drawings
2. Unless noted otherwise do not permanently attach shelf angles until concrete slabs have been poured and cured.
3. Once slabs have been poured and cured coordinate final elevation of shelf angle with contract documents and masonry contractor and permanently fasten.

L. Pour stops and edge angles: Pour stops and edge angles shall be field installed based on global building control lines to ensure overall building geometry is maintained.

1. Do not located based on local member geometry.

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: As indicated on shop drawings.

B. Finger Tight Bolts: All joints noted as finger tight shall be hand tightened as required to install elements. Do not tighten by mechanical means

1. Provide jam nuts to prevent nut from backing off.
2. After initial tightening turn nut and jam nut in opposite direction to bind them against one another.

C. Weld Connections:

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. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
3. Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
4. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
5. Architecturally Exposed Structural Steel: Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.

a. Grind butt welds flush.
b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

D. Post Installed Structural Anchors: See specification section 050520 for products

3.5 FIELD PAINTING

A. Column bases: Paint column bases below grade and/or below finished floor at exterior conditions and/or conditions specifically noted on drawings with column base paint.

1. Apply in strict accordance with manufacturer’s recommendations
2. Apply multiple coats as required by manufacturer, but not less than two individual coats allowing proper dry time between coats.

B. Field painting of structural steel for finished appearance in exposed conditions or for high performance coating systems is specified in Division 09 painting sections.

3.6 FIELD QUALITY CONTROL

A. The erector shall complete Field Quality control in accordance with AISC 360 Chapter N

B. Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements when the work was deemed deficient upon initial testing or inspection.

3.7 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

1. The coating thickness for zinc-rich paint repairs must be 50% higher than the surrounding coating thickness, but not less than 2.0 mils and not greater than 4.0 mils.
2. The repaired surface should be free of lumps, coarse areas and loose particles

B. Touchup Painting: At all exterior and exposed interior conditions promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
2. Apply a primer of same type as shop primer used on adjacent surfaces. Coordinate with Part 2 priming requirements

END OF SECTION 051200

SECTION 05 50 00 - 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 applications where framing and supports are not specified in other Sections.
2. Shelf angles.
3. Metal ladders.
4. Ladder safety cages.
5. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

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 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. Paint products.
2. Grout.

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 mechanical and electrical equipment.

2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Metal ladders.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

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 according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design ladders.

B. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

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 A 36/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

E. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

F. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches.
2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B, with G90 coating; 0.079-inch nominal thickness.
3. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B; 0.0528-inch minimum thickness; unfinished coated with rust-inhibitive, baked-on, acrylic enamel hot-dip galvanized after fabrication.

G. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

H. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

I. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

J. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

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 B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Anchors, General: Anchors 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 according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

F. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

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

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 09 91 13 "Exterior Painting," Section 09 91 23 Interior Painting," and Section 09 96 00 "High-Performance Coatings."

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. 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. Fabricate units from slotted channel framing where indicated.

C. 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.

D. Prime miscellaneous framing and supports with 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 shelf angles located in exterior walls.

D. 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.

B. Steel Ladders:

1. Space siderails 16 inches apart unless otherwise indicated.
2. Rungs: 3/4-inch- square steel bars.
3. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
4. 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.
5. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch in least dimension.
6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
7. Galvanize and prime exterior ladders, including brackets.
8. Prime exterior ladders, including brackets and fasteners, with zinc-rich primer.

    a. O'Keeffe's Inc.
    b. Royalite Manufacturing, Inc.

2.9 LADDER SAFETY CAGES

A. General:

1. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.
2. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.
3. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless-steel fasteners unless otherwise indicated.

B. Steel Ladder Safety Cages:

1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops.
3. Vertical Bars: 3/16-by-1-1/2-inch flat bars secured to each hoop.

C. Aluminum Ladder Safety Cages:

1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops.
3. Vertical Bars: 1/4-by-2-inch flat bars secured to each hoop.

2.10 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.

2.11 METAL DOWNSPOUT BOOTS

A. Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.

1. Outlet: Vertical, to discharge into pipe.
2. Refer to Civil detail drawings for size and configuration..

B. Prime cast-iron downspout boots with zinc-rich primer.

2.12 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

2.13 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.

2.14 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.

2.15 FINISHES, GENERAL

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.

2.16 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. 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 universal shop primer unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

1. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. 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.

2.17 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

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 INSTALLING 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. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

3.3 INSTALLING 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 nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. 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 Section 09 91 13 "Exterior Painting." and Section 09 91 23 "Interior Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 50 00

SECTION 06 10 53 - MISCELLANEOUS 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. Section Includes:

1. Rooftop equipment bases and support curbs.
2. Wood blocking, cants, and nailers.
3. Wood furring and grounds.
4. Wood sleepers.
5. Plywood backing panels.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

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. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.

2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.

1.6 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.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

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. 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, and similar concealed members in contact with masonry or concrete.
3. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings.

2.4 PLYWOOD BACKING PANELS

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

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where 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 A153/A153M.

B. Screws for Fastening to Metal Framing: ASTM C954, length as recommended by screw manufacturer for material being fastened.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 as appropriate for the substrate.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.6 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Sleepers to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.

H. Sort and select lumber so that natural characteristics do 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.

I. Comply with AWPA 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.

J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILER

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 INSTALLATION OF WOOD FURRING

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.4 PROTECTION

A. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 53

SECTION 061100 – STRUCTURAL WOOD FRAMING

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. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Structural Wood blocking.

1.3 PERFORMANCE REQUIREMENTS

A. The basis of design for proprietary products are as specified in this specification or the contract documents. Product substitutions must have capacities equal to or greater than values calculated for each specific condition calculated when calculated using the data in the ESR report associated with the product and in accordance with the appropriate design procedure and standards required by the building code. See requirements for substitution submittals.

1.4 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber:

1. Beams: Lumber of 2 inches nominal or greater but less than 5 inches in least dimension.
2. Columns: Lumber of 2 inches nominal or greater but less than 7 inches in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. SPIB: The Southern Pine Inspection Bureau.
2. NeLMA: Northeast Lumber Manufacturers' Association
3. WCLIB: West Coast Lumber Inspection Bureau
4. WWPA.: Western Wood Products Association
5. NLGA: National Lumber Grades Authority.
6. RIS: Redwood Inspection Service.

1.5 SUBMITTALS

A. Contractor's Statement of Responsibility Per Division 01 Section "Collective Inspections and Structural Testing"

B. Product Data

1. Dimensional Lumber

    a. For each size and grade. Indicate species and grade.

2. Nails
3. Wood Screws
4. Lag Bolts
5. Bolts
6. Post installed structural anchors: See specification section 050520

C. Evaluation Reports: For the following, from ICC-ESR:

1. Wood-preservative-treated wood.
2. Engineered wood products.
3. Power-driven fasteners.
4. Post installed structural anchors: See specification section 050520

D. Substitutions:

1. Substitution requests may only be made using products with ICC-ESR reports for the proposed product covering the specific conditions present for the use of the product on this project.
2. Substitution request shall include signed and sealed calculations demonstrating that the product is capable of providing equivalent performance of the specified product for each specific location and condition when calculated using the data in the ESR report associated with the product and in accordance with the appropriate design procedure and standards required by the building code.
3. The design shall be completed without regard for strength contribution from sheathing materials.
4. Any increase in material labor cost resulting from the substitution shall be the responsibility of the contractor.

E. Qualification Data:

1. Post Installed Structural Anchor Installer per specification section 050520
2. Powder Actuated Fastener Installer: Submit installer qualification data as stated in Quality Assurance section. Qualifications shall be submitted in a letter format for each type of anchor to be installed, and shall include the following.

    a. The specific product to be used
    b. Complete description of installation procedure
    c. Manufacturer's training certificates

1.6 QUALITY ASSURANCE

A. Post Installed Structural Anchor Installer: See specification section 050520 for requirements

B. Actuated Fastener Installer: All installers shall be experienced in installing anchors equal to type and into the substrate material required for the project. All installers shall have a manufacturer's training certificate.

C. 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.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, 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. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Wall Framing:

1. Grade: No. 2 grade.
2. Application: Interior partitions not indicated as load-bearing.
3. Species: Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

B. Exterior Wall Framing:

1. Grade: No. 2 grade

2. Species: Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Ceiling Joists:

1. Grade: No. 1
2. Species: Southern pine; SPIB. or Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

D. Rafters

1. Grade: No. 1
2. Species: Southern pine; SPIB. or Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

E. Blocking

1. Grade: #2
2. Species: Southern pine; SPIB.

2.3 ENGINEERED WOOD PRODUCTS

A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

B. Provide engineered wood products with current evaluation reports showing compliance with building code in effect for Project.

C. 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 and documented in an evaluation report.

D. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559. Required properties as follows:

1. Modulus of Elasticity, Edgewise: 1,900,000 psi.
2. Shear Modulus of Elasticity, Edgewise: 118,750 psi
3. Allowable Extreme Fiber Flexural Stress, Edgewise: 2,600 psi for 12" depth members.
4. Allowable Horizontal Shear Stress, Edgewise: 285 psi
5. Compression Perpendicular to the Grain: 750 psi
6. Compression Parallel to the Grain: 2510 psi
7. Equivalent Specific Gravity: .50

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 or Type 304 stainless steel.

B. Nails: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 hex nuts and ASTM F844 flat washers.

G. Post installed structural anchors: See specification section 050520

2.5 METAL FRAMING ANCHORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product.

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 and documented in an evaluation report.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

E. Stainless-Steel Sheet: ASTM A 666, Type 316.

1. Use for exterior locations and where indicated.

2.6 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

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.

B. Set all members with crown up.

C. All plies of multi-ply members shall be glued together with adhesive. Unless indicated otherwise each ply shall be fastened to the previous ply with (2)-rows of 16D “sinker” nails at 9” O.C.

D. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

E. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

F. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

I. All blocking to be installed between framing members shall be cut to fit snug and in direct contact with surrounding framing members.

J. 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 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 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 thickness.

K. 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.

L. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

M. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

N. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WALL FRAMING INSTALLATION

A. General: Unless noted otherwise install wall framing as follows:

B. Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs

C. Space studs not more than 16” O.C.

D. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
1. Install additional blocking as required for sheathing installation requirements.

E. Construct corners and intersections with three or more studs to provide surfaces necessary to receive sheathing.

F. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

3.3 JOIST FRAMING INSTALLATION

A. General: Unless noted otherwise install as follows:

1. Install floor joists with crown edge up
2. Space joists not to exceed 16” O.C.
3. Support ends of each member to bear full width of supporting member and anchor as follows:

    a. Where supported on wood members, by using metal framing anchors.
    b. Where framed into wood supporting members, by using metal joist hangers.

4. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 36 inches.
5. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.

6. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
7. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
8. Provide bridging between joists of type indicated below, at the midspan of joist and at intervals not exceeding 96 inches o.c., and as required for sheathing installation requirements.

    a. Solid 2x wood blocking of depth matching framing for use when blocking is required for sheathing installation requirements.
    b. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal size lumber, double-crossed and nailed at both ends to joists.
    c. Steel bridging installed to comply with bridging manufacturer's written instructions.

B. Floor Joist: Unless noted otherwise install as follows:

1. Provide solid blocking between joists under jamb studs for openings.
2. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
3. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

C. Ceiling Joist: Unless noted otherwise install as follows:

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate fasten to first joist with framing anchors.
2. Unless noted otherwise installed ceiling joists directly adjacent to rafters and face nail ceiling joist to rafter

3.4 ROOF FRAMING INSTALLATION

A. Rafters: Unless noted otherwise install as follows:

1. Space rafters not to exceed 16” O.C.
2. Notch to fit exterior wall plates and use metal framing anchors.
3. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers.
4. Where rafters abut at ridge, place directly opposite each other.
5. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and of depth equal to or greater than plumb cut of jack rafter.
6. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and of depth equal to or greater than plumb cut of jack rafter.
7. Bevel ends of jack rafters for full bearing against valley and hip framing.
8. At hips and valleys bevel cut top surface of hip/valley framing for flush bearing of sheathing
9. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.5 FASTENERS

A. Lag screws: Shall be installed as follows:

1. A predrilled clearance hole with diameter equal to 100% of the lag screw shank diameter shall be drilled to a depth equal to the unthreaded portion of the shank.
2. A predrilled lead hole with diameter equal to 75% of the lag screw shank diameter shall be drilled to a depth of the lag screw embedment.
3. The lag screw shall be inserted into the hole with a turning action and not a driving action.
4. Where not specifically indicated otherwise the minimum embedment into the main member shall be four times the lag screw shank diameter.

5. Holes in steel elements of the connection shall have a hole diameter of 1/16" diameter greater than the fastener diameter for fasteners 3/8" or greater in diameter, and 1/32" diameter greater than the fastener diameter for fasteners less than 3/8" in diameter.

B. Wood screws: Shall be installed as follows:

1. A predrilled lead hole with diameter equal to 70% of the screw root diameter shall be drilled to a depth of the wood screw embedment.
2. The wood screw shall be inserted into the hole with a turning action and not a driving action.
3. Where not specifically indicated otherwise the minimum embedment into the main member shall be six times the wood screw diameter.
4. Holes in steel elements of the connection shall have a hole diameter of 1/32" diameter greater than the fastener diameter.

C. Bolts: Shall be installed as follows:

1. Holes in wood members shall be drilled with a diameter to match the bolt diameter.
2. Holes in steel elements of the connection shall have a hole diameter of 1/16" diameter greater than the fastener diameter for fasteners 3/8" or greater in diameter, and 1/32" diameter greater than the fastener diameter for fasteners less than 3/8" in diameter.
3. A flat washer shall be provided under the head or the nut where the head or nut is bearing on the wood surface.
4. A flat washer shall be provided under the head or the nut when the head or the nut bears on a steel element and will be the turned element when tightening.

3.6 METAL FRAMING ANCHORS

A. Install metal framing anchors to comply with manufacturer's written instructions.

B. Install fasteners through each anchor hole unless noted otherwise.

C. Install fasteners of max number and size indicated in manufacturer's data unless noted otherwise.

3.7 FIELD QUALITY CONTROL

A. Testing and Inspection: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTION

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

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061100

SECTION 06 16 00 - 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. Parapet sheathing.
3. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 07 27 26 "Fluid-Applied Membrane Air Barriers" for water-resistive barrier applied over wall sheathing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review air-barrier and water-resistant glass-mat gypsum sheathing requirements and installation, special details, transitions, mockups, air-leakage testing, protection, and work scheduling that covers air-barrier and water-resistant glass-mat gypsum sheathing.

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. For air-barrier and water-resistant glass-mat gypsum sheathing, include manufacturer's technical data and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.

1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.
2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

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

B. Product Certificates: From air-barrier and water-resistant glass-mat gypsum sheathing manufacturer, certifying compatibility of sheathing accessory materials with Project materials that connect to or that come in contact with the sheathing.

C. Product Test Reports: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.

D. Evaluation Reports: For the following, from ICC-ES:

1. Air-barrier and water-resistant glass-mat gypsum sheathing.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of air-barrier and water-resistant glass-mat gypsum sheathing.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

B. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly , 150 sq. ft., incorporating backup wall construction, window, storefront, door frame and sill, ties and other penetrations, and flashing to demonstrate crack and joint treatment and sealing of gaps, terminations, and penetrations of air-barrier sheathing assembly.

    a. Coordinate construction of mockups to permit inspection and testing of sheathing before external insulation and cladding are installed.
    b. If Architect determines mockups do not comply with requirements, reconstruct mockups until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Testing Agency Qualifications:

1. 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.
2. For testing and inspecting agency providing tests and inspections related to air-barrier and water-resistant glass-mat gypsum sheathing: an independent agency, qualified according to ASTM E 329 for testing indicated, and certified by Air Barrier Association of America, Inc.

1.7 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-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Air-Barrier Performance: Air-barrier and water-resistant glass-mat gypsum sheathing assembly, and seals with adjacent construction, shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing , tie-ins to other installed air barriers, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.2 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Georgia-Pacific Building Products.
b. National Gypsum Company.
c. USG Corporation.

2. Type and Thickness: Regular, 1/2 inch thick.
3. Size: 48 by 96 inches, 48 by 108 inches, or 48 by 120 inches for vertical installation.

2.3 PARAPET SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. ICC-ES evaluation report for fastener.

D. Coordinate wall 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 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.

3.3 FIELD QUALITY CONTROL

A. Testing and Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

END OF SECTION 06 16 00

SECTION 061620 – STRUCTURAL WOOD 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. Roof sheathing.

B. Related Requirements:

1. Division 06 Section “Structural Wood Framing”

1.3 SUBMITTALS

A. Product Data:

1. Sheathing:

a. For each type required. Indicate compliance with requirements

2. Adhesive
3. Nails
4. Plywood Edge Clips

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 WOOD PANEL PRODUCTS

A. Plywood: DOC PS 2 unless otherwise indicated.

B. Oriented Strand Board: DOC PS 2.

C. Factory mark panels to indicate compliance with applicable standard.

2.2 ROOF SHEATHING

A. Plywood Roof Sheathing:

1. Exposure: Exposure I

2. Grade: Rated Sheathing

3. Span Rating: Not less than **24/0**.
4. Nominal Thickness:

a. As required to achieve span rating
b. Not less than 5/8 inch unless indicated otherwise

5. Edge Configuration: Square edged, or tongue and grooved at contractor's option

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For typical roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
2. For preservative treated or fire-retardant treated sheathing or supporting framing provide fasteners of Type 304 stainless steel.

B. Nails: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Panel Edge Clips: Manufacturer's standard "H" shape configured clip fabricated from minimum 20 ga hot dip galvanized sheet steel. Clip shall be sized to match specified sheathing.

2.4 MISCELLANEOUS MATERIALS

A. Plywood Edge Clips: Manufacturer's standard "H" shape configured clip fabricated from minimum 20 ga hot dip galvanized sheet steel. Clip shall be sized to match specified sheathing.

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.

B. Arrange joints so that pieces do not span between fewer than three support members where framing spacing is less than or equal to 16" o.c., and two supporting member where framing spacing is greater than 16" o.c.

C. Arrange joints such that minimum panel width perpendicular to span is 24" unless panel edges are fully blocked or supported.

D. Install all panels with the strength axis perpendicular to the supporting members. Unless the panel is specifically marked otherwise the strength direction shall be the long direction of the full sheet.

E. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

F. Coordinate 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.

G. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 FASTENING

A. Comply with NES NER-272 for power-driven fasteners.

B. Use common wire nails where nail fastening is 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.

C. Sheathing fasteners shall be centered in the supporting member or blocking where panel is continuous.

D. Sheathing fasteners at panel ends and edges sheathing fasteners shall be located 3/8 inch from the panel edge.

E. Fastening Pattern: Fastening pattern shall be in accordance with drawings and as follows"

1. Fasten sheathing at all blocking lines
2. Fasten sheathing at all supporting members
3. Fasten sheathing at all parallel edges terminating on framing or blocking lines
4. Fasten all sheathing edges where a fully blocked diaphragm is indicated on drawings.

F. Fastening Methods: Fasten panels as indicated below:

1. Roof Sheathing:

a. Nail to wood framing.
b. Space panels 1/8 inch apart at edges and ends.
c. Unless tongue and groove plywood is used provide one panel edge clip at midspan between support where panel span exceeds 24", and two equally spaced edge clips where supports are spaced 48" o.c. or greater.

3.3 FIELD QUALITY CONTROL

A. Testing and Inspection: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 PROTECTION

A. 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.

END OF SECTION 061620

SECTION 062013 - EXTERIOR FINISH 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. Section Includes:

1. Exterior wood trim.
2. Lumber siding.
3. Lumber soffits.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

1.4 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:

1. For lumber that is not marked with grade stamp.
2. For preservative-treated wood that is not marked with treatment-quality mark.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.

1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
2. Provide for air circulation around stacks and under coverings.

1.6 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Certified Wood: The following wood products shall be certified as "FSC Pure"[or "FSC Mixed Credit"] according to FSC STD-01-00 and FSC STD-40-004.

1. Exterior trim.
2. Exterior lumber siding.
3. Exterior soffits.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of inspection agency, indicating grade, species, moisture content at time of surfacing, and mill.
2. For exposed lumber, mark grade stamp on end or back of each piece.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
4. Mark lumber with treatment-quality mark of an inspection agency approved by the ALSC's Board of Review.

2.3 EXTERIOR TRIM

A. Lumber Trim for Clear Finish:

1. Species and Grade: Western red cedar; NLGA, WCLIB, or WWPA [Clear Heart VG (Vertical Grain)] [Clear Heart] [Grade A] [Grade B].

B. Primed Hardboard Trim: ANSI A135.6, primed with manufacturer's standard exterior primer. Recommended by manufacturer for exterior use.

2.4 LUMBER SIDING

A. Species and Grade: Western red cedar; NLGA, WCLIB, or WWPA Clear VG (Vertical Grain) Heart. Select Knotty (10-15% Quality Knotty). Kiln dried, exposed surface to be smooth. Install per manufacturer's instruction.

1. Profile: V-Notch Tongue & Groove, 1/4" Groove.
2. Size: Refer to drawings for nominal dimensions.

2.5 LUMBER SOFFITS

A. Species and Grade: Western red cedar; NLGA, WCLIB, or WWPA Grade A. Select Knotty (10-15% Quality Knotty). Kiln dried, exposed surface to be smooth. Install per manufacturer's instruction.

1. Profile: V-Notch Tongue & Groove, 1/4" Groove.
2. Size: Refer to drawings for nominal dimensions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

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

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut exterior finish carpentry to fit adjoining work.
3. Refinish and seal cuts as recommended by manufacturer.
4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
5. Coordinate exterior finish carpentry with materials and systems in or adjacent to it.
6. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary.

3.5 SIDING INSTALLATION

A. Horizontal Lumber Siding:

1. Install first course of siding, with lower edge at least 1/8 inch below starter strip and subsequent courses lapped 1 inch over course below.

    a. Nail at each stud.

2. Butt joints only over framing or blocking, nailing top and bottom on each side and staggering joints in subsequent courses.

B. Flashing: Install metal flashing as indicated on Drawings and as recommended by siding manufacturer.

3.6 CLEANING

A. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 06 41 16 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

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. Plastic-laminate-clad architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
2. Section 12 36 23.13 "Plastic-Laminate-Clad Countertops."
3. Section 12 36 61.16 "Solid Surfacing Countertops."

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in this Section or Section 08 71 00 "Door Hardware" to manufacturer of architectural cabinets; coordinate Shop Drawings and fabrication with hardware requirements.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.

2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.

D. Samples for Verification: For the following:

1. Plastic Laminates: 8 by 10 inches, for each type, color, pattern, and surface finish required.

a. Provide one sample applied to core material with specified edge material applied to one edge.

2. Thermoset Decorative Panels: 8 by 10 inches, for each color, pattern, and surface finish.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer Installer.

B. Product Certificates: For the following:

1. Composite wood and agrifiber products.
2. Thermoset decorative panels.
3. High-pressure decorative laminate.
4. Adhesives.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Architectural Woodwork Standards Grade: Custom.

C. Type of Construction: Frameless.

D. Door and Drawer-Front Style: Flush overlay.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Formica Corporation.
b. Pionite; a Panolam Industries International, Inc. brand.
c. Wilsonart.

F. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGL.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade HGS.
4. Edges: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
5. Pattern Direction: Vertically for doors and fixed panels, horizontally for drawer fronts As indicated.

G. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.

a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.

2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.

J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Match Architect's sample.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 8 to 13 4 to 9 percent.

B. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
2. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

3. Softwood Plywood: DOC PS 1, medium-density overlay.
4. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 00 "Door Hardware."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Blum, Julius & Co., Inc.
b. Doug Mockett
c. Hafele America Co.
d. Hettich America L.P.
e. Knape & Vogt Manufacturing Company.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 135 170 degrees of opening, self-closing.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal plastic, 4 inches long, 5/16 inch in diameter 5 inches long, 2-1/2 inches deep, and 5/16 inch in diameter.

E. Catches: Magnetic catches, BHMA A156.9, B03141 Push-in magnetic catches, BHMA A156.9, B03131 Roller catches, BHMA A156.9, B03071 Ball friction catches, BHMA A156.9, B03013.

F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081 BHMA A156.9, B04102; with shelf brackets, B04112.

G. Shelf Rests: BHMA A156.9, B04013; metal plastic two-pin plastic with shelf hold-down clip.

H. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer.

    a. Type: Full (90% min.) extension.
    b. Material: Zinc-plated Epoxy-coated steel with polymer rollers.
    c. "Soft-close" type closure operation.
2. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
3. For drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide Grade 1.
4. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100.
5. For computer keyboard shelves, provide Grade 1.
6. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-100.

I. Door Locks: BHMA A156.11, E07121.

J. Drawer Locks: BHMA A156.11, E07041.

K. Grommets for Cable Passage: 1-1/4-inch 2-inch Insert dimension OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Color: White.

L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Stainless Steel: BHMA 630.

M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.5 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

D. Install glass to comply with applicable requirements in Section 08 80 00 "Glazing" and in GANA's "Glazing Manual."

1. For glass in frames, secure glass with removable stops.
2. For exposed glass edges, polish and grind smooth.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 06 41 16

SECTION 07 11 13 - 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 the following:

1. Cold-applied, emulsified-asphalt dampproofing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each product, signed by manufacturers.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Degussa Building Systems; Sonneborn Brand Products. Basis-of-Design: Hydrocide.
2. Gardner Gibson, Inc.
3. Henry Company.
4. Karnak Corporation.
5. Meadows, W. R., Inc.

B. Trowel Coats: ASTM D 1227, Type II, Class 1.

C. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

D. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

E. VOC Content: 0.25 lb/gal. or less.

2.2 PROTECTION COURSE

A. Protection Course: Unfaced, fan-folded, extruded-polystyrene board insulation, nominal thickness 1/4 inch with compressive strength of not less than 8 psi per ASTM D 1621.

2.3 MISCELLANEOUS MATERIALS

A. Cut-Back Asphalt Primer: ASTM D 41.

B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

D. Patching Compound: Manufacturer's fibered mastic of type recommended by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.

1. Proceed with dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. 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.

B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

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 additional coats if recommended by manufacturer or if required to achieve coverages indicated.
2. Allow each coat of dampproofing to cure 12 hours before applying subsequent coats.
3. Allow 24 hours drying time prior to backfilling.

B. Apply dampproofing to footings and foundation walls where opposite side of wall faces building interior.

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 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.

D. Apply dampproofing to provide continuous plane of protection on interior face of above-grade, exterior concrete and masonry walls unless walls are indicated to receive direct application of paint.

1. Continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by delaying construction of intersecting walls until dampproofing is applied.

3.4 COLD-APPLIED, CUT-BACK ASPHALT DAMPPROOFING

A. On Concrete Foundations[and Parged Masonry Foundation Walls]: Apply 2 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 1 trowel coat at not less than 4 gal./100 sq. ft..

3.5 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. On Concrete Foundations and Parged Masonry Foundation Walls: Apply 2 brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, 1 fibered brush or spray coat at not less than 3 gal./100 sq. ft., or 1 trowel coat at not less than 4 gal./100 sq. ft..

B. On Unparged Masonry Foundation Walls: Apply primer and 2 brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, primer and 1 fibered brush or spray coat at not less than 3 gal./100 sq. ft., or primer and 1 trowel coat at not less than 5 gal./100 sq. ft..

C. On Unparged Masonry Foundation Walls: Apply primer and 1 trowel coat at not less than 5 gal./100 sq. ft..

D. On Unexposed Face of Concrete Retaining Walls: Apply 1 brush or spray coat at not less than 1.25 gal./100 sq. ft..

E. On Unexposed Face of Masonry Retaining Walls: Apply primer and 1 brush or spray coat at not less than 1.25 gal./100 sq. ft..

F. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and 1 brush or spray coat at not less than 1 gal./100 sq. ft..

G. On Interior Face of Single-Wythe Exterior Masonry Walls: Where above grade and indicated to be furred and finished, apply primer and 1 brush or spray coat at not less than 1 gal./100 sq. ft..

3.6 INSTALLATION OF PROTECTION COURSE

A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing material manufacturer's written recommendations for attaching protection course.

1. Support protection course with spot application of adhesive of type recommended by protection board manufacturer over cured coating.
2. Install protection course within 24 hours of installation of dampproofing (while coating is tacky) to ensure adhesion.

3.7 CLEANING

A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION 07 11 13

SECTION 07 21 00 - 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.
2. Glass-fiber blanket.
3. Mineral-wool blanket.

B. Related Requirements:

1. Division 07 roofing sections for insulation specified as part of roofing construction.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Evaluation 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

A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.

B. Extruded Polystyrene Board, Type IV : ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

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. Dow Chemical Company (The).
b. Owens Corning.
c. Kingspan Insulation North America; GreenGuard XPS.

2.2 GLASS-FIBER BLANKET

A. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. CertainTeed Corporation.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.

2.3 MINERAL-WOOL BLANKETS

A. Mineral-Wool Blanket, Unfaced : ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. Provide 6 p.c.f. minimum density product.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ROXUL.
b. Thermafiber, Inc.; an Owens Corning company.

2.4 SPRAY FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. BASF Corporation.
    b. BaySystems NorthAmerica, LLC.
    c. Dow Chemical Co.
    d. Gaco Western.
    e. Henry Company.
    f. NCFI; Division of Barnhardt Mfg. Co.

2. Minimum density of 1.5 lb/cu. ft., thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.
3. Use: for filling gaps and penetrations through plastic board insulation.

B. Thermal Barrier for Exposed Spray Foam Insulation: Provide one of the following in accordance with applicable code to separate spray foam from the interior:

1. 1/2" minimum gypsum wall board.
2. 1" minimum masonry constrution.
3. Other code approved material consistent with type of construction.

2.5 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

B. 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.

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.

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.

3.3 INSTALLATION OF SLAB INSULATION

A. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

3.4 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. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 04 20 00 "Unit Masonry."

3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. 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. 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.

B. 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 at voids in cavity wall plastic insulation according to manufacturer's written instructions.

3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.7 INSULATION SCHEDULE

A. Masonry Cavity Wall Insulation: Type IV Extruded Polystyrene Board Insulation. 2 inches thick Unless Noted Otherwise.

B. Metal Stud Wall with Masonry Veneer: Type IV Extruded Polystyrene Board Insulation. 2 inches thick Unless Noted Otherwise.

C. Under Slab Insulation: Type IV Extruded Polystyrene Board Insulation. 1 inch thick U. N. O.

D. Acoustical insulation: Unfaced Fiberglass Batt Insulation.

END OF SECTION 07 21 00

SECTION 072411 - DIRECT APPLIED EXTERIOR FINISH SYSTEM (DEFS)

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. Section Includes:

1. Direct-applied Exterior Finish System (DEFS) applied over exterior cement board.

1.3 SYSTEM DESCRIPTION

A. DEFS: A non-load-bearing, exterior wall cladding system that consists of an exterior cement board attached mechanically, to the substrate; an integrally reinforced base coat; and a textured protective finish coat.

B. EIFS: Exterior Insulation and Finish System. A non-load-bearing, exterior wall cladding system that consists of a rigid insulation board attached to the substrate; an integrally reinforced base coat; and a textured protective finish coat.

1.4 PERFORMANCE REQUIREMENTS

A. DEFS Performance: Comply with the following:

1. Bond Integrity: Free from bond failure within DEFS components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
2. Weathertightness: Resistant to water penetration from exterior into DEFS and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of DEFS and assemblies behind it, including substrates, supporting wall construction, and interior finish.

1.5 SUBMITTALS

A. Product Data: For each type and component of DEFS indicated.

B. Samples for Initial Selection: For each type of finish-coat color and texture indicated.

C. Qualification Data: For Installer, fabricator/erector, and testing agency.

D. Manufacturer Certificates: Signed by manufacturers certifying that DEFS comply with the requirements of ICC-ES AC59.

E. Maintenance Data: For DEFS to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer who is certified in writing by EIFS manufacturer as qualified to install manufacturer's EIFS or DEFS system using trained workers.

B. Source Limitations: Obtain DEFS from single source from single DEFS manufacturer and from sources approved by DEFS manufacturer as compatible with system components.

C. Fire-Test-Response Characteristics: Provide DEFS and system components with the following fire-test-response characteristics as determined by testing identical DEFS and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E 119.
2. Full-Scale Diversified Fire Test: Tested mockup, representative of completed multistory wall assembly of which DEFS is a part, showing no significant contribution to vertical or horizontal flame spread per ASTM E 108 modified for testing vertical walls.
3. Radiant Heat Exposure: No ignition of DEFS when tested according to NFPA 268.
4. Potential Heat: Acceptable level when tested according to NFPA 259.
5. Surface-Burning Characteristics: Provide insulation board, adhesives, base coats, and finish coats with flame-spread index of 25 or less and smoke-developed index of 450 or less, per ASTM E 84.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.

B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1. Stack cement board flat and off the ground.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Maintain ambient temperatures above 40 deg F for a minimum of 24 hours before, during, and after adhesives or coatings are applied. Do not apply DEFS adhesives or coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit DEFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify actual dimensions required for prefabricated panels by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate installation of DEFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, weather resistant barrier, flashing, trim, joint sealants, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind flashing and barrier coating of DEFS.

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. Dryvit Systems, Inc.; Product: Fastrack System
2. Finestone; Degussa Wall Systems, Inc. Product: "Finescreen 1000"
3. Parex, Inc.; a brand of ParexLahabra, Inc. Product: "DAFS Direct Applied Finish System"
4. Senergy; Degussa Wall Systems, Inc. Product: "Cement-Board Stucco 1000 System"
5. Sto Corp. Product "StoQuik Silver NExT Cement Board Stucco"

2.2 MATERIALS

A. Compatibility: Provide adhesive, fasteners, board insulation, reinforcing meshes, base- and finish-coat systems, sealants, and accessories that are compatible with one another and with substrates and approved for use by DEFS / EIFS manufacturer for Project.

B. EIFS and DEFS shall be manufactured by the same company.

C. Exterior Cement Board: Not less than 7/16-inch thick, fiber cement board complying with ASTM C 1186, Type A, for exterior applications.

1. Fasteners: Wafer-head or flat-head steel drill screws complying with ASTM C 954, with an organic-polymer coating or other corrosion-protective coating having a salt-spray resistance of more than 500 hours per ASTM B 117.

a. Size and Length: As recommended by sheathing manufacturer for type and thickness of sheathing board to be attached.

D. Flexible Membrane Flashing: Cold-applied, fully self-adhering, self-healing, rubberized-asphalt and polyethylene-film composite sheet or tape and primer; DEFS manufacturer’s standard or product recommended in writing by DEFS manufacturer.

E. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. per ASTM E 2098; complying with ASTM D 578 and the following:

1. Standard-Impact Reinforcing Mesh: Not less than 4.0 oz./sq. yd. .
2. Strip Reinforcing Mesh: Not less than 3.75 oz./sq. yd. .
3. Detail Reinforcing Mesh: Not less than 4.0 oz./sq. yd. .
4. Corner Reinforcing Mesh: Not less than 7.2 oz./sq. yd. .

F. Base-Coat Materials: DEFS manufacturer's standard mixture complying with one of the following:

1. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.
2. Factory-mixed noncementitious formulation of polymer-emulsion adhesive and inert fillers that is ready to use without adding other materials.

G. Primer: DEFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.

H. Finish-Coat Materials: DEFS manufacturer's standard acrylic-based coating complying with the following:

1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, and fillers used with stone particles for embedding in finish coat to produce an applied-aggregate finish.

a. Aggregate: Marble chips of size and color as indicated by manufacturer's designations.

2. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.
3. Colors: As indicated by manufacturer's designations. Selected by Architect from full range.

I. Water: Potable.

J. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with DEFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D 1784, manufacturer's standard Cell Class for use intended, and ASTM C 1063.

1. Casing Bead: Prefabricated, one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
2. Expansion Joint: Prefabricated, one-piece V profile; designed to relieve stress of movement.

2.3 ELASTOMERIC SEALANTS

A. Elastomeric Sealant Products: Provide DEFS manufacturer's listed and recommended chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials, and complies with requirements for products and testing indicated in ASTM C 1481 and with requirements in Division 07 Section "Joint Sealants" for products corresponding to description indicated below:

1. Single-component, nonsag, neutral-curing silicone sealant.

B. Sealant Color: As selected by Architect from manufacturer's full range.

2.4 MIXING

A. General: Comply with DEFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by DEFS manufacturer. Mix materials in clean containers. Use materials within time period specified by DEFS manufacturer or discard.

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 DEFS.

B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where DEFS will be installed.

C. Examine sheathing substrate for damage or incomplete coverage.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Begin coating application only after surfaces are dry.
2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of DEFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect DEFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind DEFS and deterioration of substrates.

C. Prepare and clean substrates to comply with DEFS manufacturer's written instructions to obtain optimum bond between substrate and finish.

3.3 EXTERIOR CEMENT-BOARD INSTALLATION

A. Comply with cement-board manufacturer's written instructions and evaluation report acceptable to authorities having jurisdiction. Install board with steel drill screws spaced no more than 8 inches o.c. along framing with perimeter fasteners at least 3/8 inch but less than 5/8 inch from edges of boards.

3.4 DEFS INSTALLATION, GENERAL

A. Comply with ASTM C 1397 and DEFS manufacturer's written instructions for installation of DEFS as applicable to each type of substrate indicated.

3.5 TRIM INSTALLATION

A. Trim: Apply trim accessories at perimeter of DEFS, at expansion joints, and elsewhere as indicated, according to DEFS manufacturer's written instructions. Coordinate with installation of insulation.

1. Soffit Vent: Apply continuous strip vent at soffits.
2. Expansion Joint: Use where indicated on Drawings, and at perimeter of infill installations.

3.6 BASE-COAT INSTALLATION

A. Base Coat: Apply to exposed surfaces of insulation in minimum thickness recommended in writing by DEFS manufacturer, but not less than 1/16-inch dry-coat thickness.

B. Reinforcing Mesh: Embed type indicated below in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C 1397 and DEFS manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible.

1. Standard-impact reinforcing mesh unless otherwise indicated.

C. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings extending 4 inches beyond perimeter. Apply additional 9-by-12-inch strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch wide strip reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches on each side of corners.

1. At aesthetic reveals, apply strip reinforcing mesh not less than 8 inches wide.
2. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.

3.7 FINISH-COAT INSTALLATION

A. Finish Coat: Apply over dry base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by DEFS manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.

1. Texture: As selected by Architect from manufacturer's full range.
2. Embed aggregate in finish coat according to DEFS manufacturer's written instructions to produce a uniform applied-aggregate finish of color and texture matching approved sample.

3.8 INSTALLATION OF JOINT SEALANTS

A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements in Division 07 Section "Joint Sealants" and in ASTM C 1481.

1. Apply joint sealants after base coat has cured but before applying finish coat.
2. Clean surfaces to receive sealants to comply with indicated requirements and DEFS manufacturer's written instructions.
3. Apply primer recommended in writing by sealant manufacturer for surfaces to be sealed.
4. Install sealant backing to control depth and configuration of sealant joint and to prevent sealant from adhering to back of joint.
5. Apply masking tape to protect areas adjacent to sealant joints. Remove tape immediately after tooling joints, without disturbing joint seal.

3.9 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. According to ICC-ES AC59.

B. Remove and replace DEFS where test results indicate that DEFS do not comply with specified requirements.

3.10 CLEANING AND PROTECTION

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive DEFS coatings.

END OF SECTION 072411

SECTION 07 26 23 - UNDER-SLAB VAPOR BARRIER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing 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. Vapor Barrier membrane
2. Seam tape
3. Vapor barrier mastic
4. Pipe boots
5. Detail strip

1.3 SUBMITTALS

A. Product Data: For each type of membrane, tape, mastic, and accessories indicated. Include construction details relative to materials, individual components and assembly for a complete under-slab vapor retarding system.

B. Manufacturer's installation instructions for installation of under-slab vapor retarder system. Include plans, details, terminations, penetrations, pipe boots, and attachments to other Work.

C. Samples: For each vapor barrier sheet, at least 3 by 5 inches in size.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain vapor barrier sheet, tape, mastic, and accessories through one source from a single manufacturer.

1.5 COORDINATION

A. Prepare materials for installation prior to placing reinforcing and concrete.

PART 2 - PRODUCTS

2.1 VAPOR BARRIERS

A. Vapor barrier shall have all of the following qualities:

1. Maintain permeance of less than 0.01 Perms (grains/ft^2 · hr · in Hg) as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).

2. Other performance criteria:

    a. Strength: ASTM E1745 Class A.
    b. Thickness: 15 mils minimum

3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1

B. Vapor barrier products:

1. Basis of Design Product: Stego Wrap Vapor Barrier (15-mil) by Stego Industries, LLC.
2. Subject to compliance with requirements, provide comparable products by one of the following:

    a. Approved Alternate: Vaporguard by Reef Industries
    b. Approved Alternate: Miostop Ultra 15 Mil
    c. No substitutions/

C. Seam Tape: Manufacturer's recommended adhesive or pressure-sensitive tape, tested to 0.3 perms or lower, per ASTM E 96

1. Basis of Design Product: Stego Industries, LLC; Stego Tape
2. Subject to compliance with requirements and manufacturer¢s written instructions, comparable products by one of the following may be provided:

    a. Fortifiber Corporation
    b. Reef Industries, Inc

D. Vapor Proofing Mastic: 0.3 perms or lower, per ASTM E 96

1. Basis of Design Product: Stego Industries, LLC; Stego Mastic
2. Subject to compliance with requirements and manufacturer¢s written instructions, comparable products by one of the following may be provided:

    a. Fortifiber Corporation
    b. Reef Industries, Inc

E. Pipe Boots: Construct from vapor barrier material, pressure sensitive tape, and / or mastic per manufacturer's written instructions.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that subsoil or granular fill is approved by Architect or Special Inspector.

1. Level and tamp or roll granular fill aggregate, sand, or compacted earth.

3.2 VAPOR BARRIER INSTALLATION

A. Install Vapor Barrier / Retarder: in accordance with ASTM E 1643 and manufacturer's written instructions.

1. Unroll vapor barrier/retarder with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.

2. At conditions terminating into a wall, it is important that continuity of the vapor barrier is maintained and sealed to the exterior stem wall or slab turn-down.

    a. Complete termination to exterior conditions as indicated on drawings for typical conditions, i.e following specific procedure for turning a strip of vapor retarder down and sealing to wall or footing, compacting the earth at the perimeter, and lapping back onto field vapor barrier and sealing all joints.
    b. Alternatively, contractor may turn vapor retarder up wall, extend to top of slab and seal to wall with manufacturer's tape in strict accordance with manufacturer's recommendations.
    c. Specific conditions that compromise continuity of the vapor barrier seal to the exterior wall should be brought to the attention of the architect, and an alternative solution devised that fulfills the intent of the vapor barrier.

3. Overlap joints (seams) per manufacturer, but in no case less than 6 inches and seal with manufacturer's seam tape.

4. Extend vapor barrier to edge of slab in all cases.

5. Seal all penetrations (including pipes, columns, and permanent stakes) per manufacturer's instructions.

6. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities. Do not use non-permanent stakes driven through the vapor barrier.

7. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.

8. Repair damaged areas with vapor barrier material of same or better permeance, puncture, and tensile strength.Cutting patches of vapor barrier/retarder, overlapping damaged areas 6 inches and seal perimeter with seam tape in strict accordance with manufacturer¢s recommendations for repair.

END OF SECTION 07 26 23

SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

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 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly , 150 sq. ft., incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.

c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

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

B. VOC Content: 100 g/L or less.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR PERMEABLE

A. High-Build, Vapor-Permeable Air Barrier: synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.

1. Synthetic Polymer Type:

a. Products: Subject to compliance with requirements, provide one of the following:

1) Grace Construction Products; W.R. Grace & Co. -- Conn.; Perm-A-Barrier VPL.
2) Tremco Incorporated; ExoAir 230.

2. Physical and Performance Properties:

a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
b. Vapor Permeance: Minimum 10 perms; ASTM E 96/E 96M, Desiccant Method, Procedure A.
c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.
d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541.
e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
f. UV Resistance: Can be exposed to sunlight for 90 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 123 Silicone Seal.
b. GE Construction Sealants; Momentive Performance Materials Inc.; US11000 UltraSpan.
c. Tremco Incorporated; Spectrem Simple Seal.
d. Insert manufacturer's name; product name or designation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.

3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

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

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip or preformed silicone extrusion so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.

1. Transition Strip: Roll firmly to enhance adhesion.
2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

H. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, transition strip.

I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.

B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.

1. Vapor-Permeable, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils , applied in one or more equal coats.

C. Do not cover air barrier until it has been tested and inspected by testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Air-barrier dry film thickness.
3. Continuous structural support of air-barrier system has been provided.
4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
5. Site conditions for application temperature and dryness of substrates have been maintained.
6. Maximum exposure time of materials to UV deterioration has not been exceeded.
7. Surfaces have been primed, if applicable.
8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
9. Termination mastic has been applied on cut edges.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.

D. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to [ASTM E 783] [or] [ASTM E 2357].
3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.

E. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

G. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

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 standing-seam metal roof panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal 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. Retain strippable protective covering on metal panels during installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal 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.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft..

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft..

D. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 60.

F. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A-90.
2. Hail Resistance: MH.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

STANDING-SEAM METAL ROOF PANELS

H. 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.

I. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels : Formed with vertical 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, engaging opposite edge of adjacent panels, and snapping panels together.

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:

2. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

   a. AEP Span; a BlueScope Steel company.
   b. CENTRIA Architectural Systems.
   c. MBCI; a division of NCI Building Systems, L.P.
   d. McElroy Metal, Inc.

3. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

   a. Nominal Thickness: 0.040 inch.
   b. Exterior Finish: Two-coat fluoropolymer.
   c. Color: As selected by Architect from manufacturer's full range.

4. Clips: One-piece fixed to accommodate thermal movement.

   a. Material: 0.028-inch- nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.

5. Panel Coverage: 12 inches.

2.2 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
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 Residential, a division of Carlisle Construction Materials; WIP 300HT.
   b. Grace Construction Products, a unit of W. R. Grace & Co.; [Grace Ice and Water Shield HT] [Ultra].
   c. Henry Company; Blueskin PE200 HT.
   d. Owens Corning; WeatherLock Metal High Temperature Underlayment.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, 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 and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
4. Snow Guards: Provide non-penetrating metal clamp-to-seam style snowguards at roof perimeter. Match material and finish of metal panels. Spacing to be recommended by manufacturer. Basis of Design: Alpine Snow Guards – ASG33G Standing Seam Pad-Style Snow Guard

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels 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. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 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. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. 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.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. 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 same piece are unacceptable. 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.

C. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches.[Extend underlayment into gutter trough.] Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.

B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.4 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Accessory Installation: 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 panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

F. 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 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 achieve 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 with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.16

SECTION 07 62 00 - 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. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 07 95 13.13 "Interior Expansion Joint Cover Assemblies" for manufactured expansion-joint cover assemblies for interior floors, walls, and ceilings.
3. Section 07 95 13.16 "Exterior Expansion Joint Cover Assemblies" for manufactured expansion-joint cover assemblies for exterior building walls, soffits, and parapets.

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 requirements for insurance and certificates if applicable.

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.

C. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested.

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.

1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

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.

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.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

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, ambient; 180 deg F, material surfaces.

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. Aluminum Sheet: ASTM B 209 , alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish:

a. Three-Coat Fluoropolymer: AAMA 2605. 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.

2. Color: Match Architect's sample.
3. 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 .

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; with smooth, flat surface.

1. Finish: 2D (dull, cold rolled).

2.3 UNDERLAYMENT MATERIALS

A. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F; and complying with physical requirements of ASTM D 226/D 226M for Type I and Type II felts.

B. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Grace Construction Products; W.R. Grace & Co. -- Conn.; Grace Ice and Water Shield HT.
b. Henry Company; Blueskin PE200 HT.
c. Owens Corning; [WeatherLock Metal High Temperature Underlayment][WeatherLock Specialty Tile and Metal Underlayment].

C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft.minimum.

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.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. 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.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in 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 to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners 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 on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. 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.

I. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps 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. Shop fabricate interior and exterior corners.

1. Gutter Profile: Style A according to cited sheet metal standard.
2. Expansion Joints: Butt type with cover plate.
3. Gutters with Girth 16 to 20 Inches : Fabricate from the following materials:

    a. Aluminum: 0.040 inch thick.

4. Gutters with Girth 21 to 25 Inches : Fabricate from the following materials:

    a. Aluminum: 0.050 inch thick.

B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.

1. Fabricated Hanger Style: Fig 1-35B according to SMACNA's "Architectural Sheet Metal Manual."
2. Fabricate from the following materials:

    a. Aluminum: 0.024 inch thick.

C. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes[, exterior flange trim,] [and] [built-in overflows]. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long sections. Furnish with 6-inch- wide, joint cover plates.

1. Joint Style: Butted with expansion space and 6-inch- wide, concealed backup plate.
2. Fabricate from the Following Materials:

    a. Aluminum: 0.050 inch thick.

B. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.

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

3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches .

B. 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 staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches . Roll laps and edges with roller. Cover underlayment within 14 days.

C. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

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], 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, levels, and slopes. 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. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.

B. 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 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.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. 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.

E. 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 into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, 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.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

F. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements 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.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Reglets: Installation of reglets is specified in 034100 - Precast Concrete

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 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. 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 07 62 00

SECTION 07 92 00 - 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. Urethane joint sealants.
3. Latex joint sealants.
4. Solvent-release-curing joint sealants.
5. Acoustical joint sealants.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Division 07 Section "Expansion Control" for building expansion joints.
3. Division 08 Section "Glazing" for glazing sealants.
4. Division 09 Section "Gypsum Board" for sealing perimeter joints.
5. Division 09 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with acoustical sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. 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.

C. 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.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Field-Adhesion Test Reports: For each sealant application tested.

D. Warranties: Sample of special warranties.

1.5 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 each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. 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.

E. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer 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.

1.7 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which 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: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 790 NS Parking Structure Sealant.
b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
c. Pecora Corporation; 301 NS 311 NS 890 890FTS890NST.
d. Tremco Incorporated; Spectrem 1.

B. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade P, Class 100/50, for Use T.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 890-SL SL Parking Structure Sealant.
b. Pecora Corporation; 300 SL 310 SL.
c. Tremco Incorporated; Spectrem 900 SL.

C. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pecora Corporation; 898.
b. Tremco Incorporated; Tremsil 200.

2.3 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Building Systems; Sonolac.
b. Pecora Corporation; AC-20+.
c. Tremco Incorporated; Tremflex 834.

2.4 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin)Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 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 joint-sealant performance.

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.

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. Architectural Composite Material, ACM
    d. Other nonporous joint substrates.

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 bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified 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 where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

H. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

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 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 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 passes 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 fill, 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 and remove 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: "JS-1".

1. Joint Locations:

    a. Isolation and contraction joints in cast-in-place concrete slabs.
    b. Joints between plant-precast architectural concrete paving units.
    c. Joints in stone paving units, including steps.
    d. Joints between different materials listed above.
    e. Other joints as indicated.

2. Silicone Joint Sealant: Single component, pourable, traffic grade, neutral curing.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces: "JS-2".

1. Joint Locations:

a. Construction joints in cast-in-place concrete.
b. Joints between plant-precast architectural concrete units.
c. Control and expansion joints in unit masonry.
d. Joints in glass unit masonry assemblies.
e. Joints between metal panels.
f. Joints between different materials listed above.
g. Perimeter joints between materials listed above and frames of doors windowsand louvers.
h. Control and expansion joints in ceilings and other overhead surfaces.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50 Single component, nonsag, neutral curing, Class 50 Single component, nonsag, acid curing Multicomponent, nonsag, neutral curing.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces "JS-3".

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces: JS-4".

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Vertical joints on exposed surfaces of interior unit masonry concrete walls and partitions.
d. Joints on underside of plant-precast structural concrete beams and planks.
e. Perimeter joints between interior wall surfaces and frames of interior doorswindows and elevator entrances.
f. Other joints as indicated.

2. Joint Sealant: Latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces : "JS-5".

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.

2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone Single component, nonsag, mildew resistant, acid curing Insert joint sealant.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 08 11 13 - 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:

1. Standard hollow metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
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. Other Action Submittals:

1. 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 door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: 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.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to finish of 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 under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate installation of anchorages 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.

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. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Mesker Door Inc.
4. Pioneer Industries, Inc.
5. Republic Doors and Frames.
6. Steelcraft; an Ingersoll-Rand company.

2.2 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 G60 or A60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z 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: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

G. 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-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

H. Glazing: Comply with requirements in Division 08 Section "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel.

2. Core Construction: Manufacturer's standard kraft-paper honeycomb, mineral-board, or vertical steel-stiffener core.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
    b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than R-2.4 when tested according to ASTM C 1363.

        1) Locations: Exterior doors interior doors where indicated.
        2) Fill material: Fill voids in door with manufacturer's standard polystyrene, polyurethane, polyisocyanurate insulating materials to meet project requirements.

3. Vertical Edges for Single-Acting Doors: Beveled edge.

    a. Beveled Edge: 1/8 inch in 2 inches.

4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).
2. Thermally insulated.

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Frames for Exterior Steel Doors: 0.067-inch- thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.

3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
4. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.
5. Frames for Wood Doors: 0.053-inch- thick steel sheet.
6. Frames for Borrowed Lights: 0.053-inch- thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 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 thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-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, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.8 LOUVERS

A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

2.9 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

C. Rain Guards: At exterior locations where not covered by an overhead structure or copy.

2.10 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 thickness of metal. 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. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. 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. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and Transom Bar 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.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Two anchors per jamb up to 60 inches high.
2) Three anchors per jamb from 60 to 90 inches high.
3) Four anchors per jamb from 90 to 120 inches high.

b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches high.
2) Four anchors per jamb from 60 to 90 inches high.
3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

c. Compression Type: Not less than two anchors in each jamb.
d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites 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 type of glazing and type of installation indicated.

2.11 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

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. 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. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. 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 ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, 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 glazing 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 plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

   a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

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 Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

SECTION 08 33 13 - COILING COUNTER 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:

1. Counter doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of coiling counter door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.

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, and 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.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats, including full vision window secured to slat.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For coiling counter 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.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.

2.2 COUNTER DOOR ASSEMBLY

A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.

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. Cookson Company.
b. Cornell Iron Works, Inc.
c. McKeon Rolling Steel Door Company, Inc.
d. Overhead Door Corporation.

B. Operation Cycles: Door components and operators capable of operating for not less than 10,000. 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. Door Curtain Material: Aluminum.

D. Door Curtain Slats: Flat profile slats of 1-1/2-inch center-to-center height.

E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated aluminum extrusion and finished to match door.

F. Hood: Match curtain material and finish.

1. Shape: Round.
2. Mounting: Face of wall Between jambs.

G. Locking Devices: Equip door with locking device assembly.

1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumbturn.

H. Manual Door Operator: Push-up operation or Manufacturer's standard crank operator.

1. Provide operator with manufacturer's standard removable operating arm.

I. Door Finish:

1. Aluminum Finish: Powder coated.

    a. Color: As selected by Architect from manufacturer's full range.

2.3 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate coiling counter door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Aluminum Door Curtain Slats: ASTM B 209 sheet or ASTM B 221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch; and as required.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

1. Removable Posts and Jamb Guides: Manufacturer's standard.

2.4 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Aluminum: 0.040-inch- thick aluminum sheet complying with ASTM B 209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.

2.5 CURTAIN ACCESSORIES

A. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

2.6 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.7 MANUAL DOOR OPERATORS

A. General: Equip door with manual door operator by door manufacturer.

B. Crank Operator: Consisting of crank and crank gearbox, steel crank drive shaft, and gear-reduction unit, of type indicated. Size gears to require not more than 25-lbf force to turn crank. Fabricate gearbox to be oiltight and to completely enclose operating mechanism. Provide manufacturer's standard crank-locking device.

2.8 GENERAL FINISH REQUIREMENTS

A. 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.

2.9 STEEL AND GALVANIZED-STEEL FINISHES

A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. 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 coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

3.3 FIELD QUALITY CONTROL

A. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

B. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 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 seals to provide tight fit around entire perimeter.

3.6 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION 08 33 13

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

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. Exterior and interior storefront framing.
2. Storefront framing for window walls.
3. Storefront framing for punched openings.
4. Exterior and interior manual-swing entrance doors and door-frame units.
5. Interior aluminum pivot doors.

B. Related Sections:

1. Division 08 Section "Glazed Aluminum Curtain Walls" for curtain-wall systems that mechanically retain glazing on four sides.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Wind Loads: As indicated on Drawings.

C. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.

1. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
2. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

D. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft..

E. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

F. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
3. Refer to Division 8 Section "Door Hardware".

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the 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.

E. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of aluminum-framed systems.
2. Include design calculations.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Preconstruction Test Reports: For sealant.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

D. Quality-Control Program for Structural-Sealant-Glazed System: Include reports.

E. Field quality-control reports.

F. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum framed storefronts that meet or exceed energy performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.

B. Single-Source Manufacturer: For glazed aluminum curtain wall and aluminum-framed entrances and storefronts. Obtain from same manufacturer.

C. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

D. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

E. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. 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. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

F. Accessible Entrances: Comply with applicable provisions in ICC/ANSI A117.1.

G. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

H. Preinstallation Conference: Conduct conference at Project site.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems 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 caused by thermal movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water leakage through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. 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 entrance door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide YKK YES 600 and YES 40FS products indicated on Drawings or comparable product by one of the following:

1. EFCO Corporation.
2. Kawneer North America; an Alcoa company.
3. Tubelite.
4. YKK AP America Inc.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
2. Extruded Structural Pipe and Tubes: ASTM B 429.
3. Structural Profiles: ASTM B 308/B 308M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.

a. SF-1 Thermally broken, 1-3/4 x 4-1/2 inch nominal depth, 1 inch glazing.

2. Glazing System: Retained mechanically with gaskets on four sides .
3. Glazing Plane: Front.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

1. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
3. Reinforce members as required to receive fastener threads.

C. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.

D. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:

1. Structural Sealant: ASTM C 1184, single-component neutral-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 a structural-sealant manufacturer for use in aluminum-framed systems indicated.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
2. Door Design: As indicated Wide stile, 5-inch nominal width, 6-1/2-inch top rail, 10-inch bottom rail.

a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane. -Provide for all storefront doors.
b. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
c. Provide nonremovable glazing stops on outside of door.

2.6 ENTRANCE DOOR HARDWARE

A. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.

1. Opening-Force Requirements:

a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.
b. Accessible Interior Doors: Not more than 5 lbf to fully open door.
c. Coordinate with power-assist operators.

B. Pivot Hinges: BHMA A156.4, Grade 1.

C. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

D. Cylinders: As specified in Division 08 Section "Door Hardware."

E. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

F. Concealed Overhead Holders: BHMA A156.8, Grade 1.

G. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.

H. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

I. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

2.7 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.8 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. Framing Members, General: 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. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Storefront Framing: Fabricate components for assembly using head-and-sill-receptor system with shear blocks at intermediate horizontal members.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. 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.

2.9 ALUMINUM FINISHES

A. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: Match Architect's sample.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate structural-sealant-glazed systems.

B. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive phases as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

END OF SECTION 08 41 13

SECTION 08 71 00 - 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. Section Includes:

1. Mechanical door hardware for the following:

a. Swinging doors.

2. Cylinders for door hardware specified in other Sections.

B. Related Requirements:

1. Section 08 33 23 "Overhead Coiling Doors" for door hardware provided as part of overhead coiling door assemblies.
2. Section 08 33 26 "Overhead Coiling Grilles" for door hardware provided as part of overhead coiling grille assemblies.
3. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for entrance door hardware, except cylinders.

1.3 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. 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. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Conference participants shall include Installer's Architectural Hardware Consultant and Owner's security consultant.

B. Keying Conference: Conduct conference at Project site.

1. Conference participants shall include Installer's Architectural Hardware Consultant and Owner's security consultant.
2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:

    a. Flow of traffic and degree of security required.
    b. Preliminary key system schematic diagram.
    c. Requirements for key control system.
    d. Requirements for access control.
    e. Address for delivery of keys.

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.

B. Shop Drawings: For electrified door hardware.

1. Include diagrams for power, signal, and control wiring.
2. Include details of interface of electrified door hardware and building safety and security systems.

C. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Submittal Sequence: Submit door hardware schedule [after] [or] [concurrent with] submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
2. Format: Use same scheduling sequence and format[and use same door numbers] as in door hardware schedule in the Contract Documents.
3. Content: Include the following information:

    a. Identification number, location, hand, fire rating, size, and material of each door and frame.
    b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
    c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
    d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
    e. Fastenings and other installation information.
    f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
    g. Mounting locations for door hardware.
    h. List of related door devices specified in other Sections for each door and frame.

D. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Architectural Hardware Consultant.

1.7 CLOSEOUT SUBMITTALS

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

B. Schedules: Final door hardware and keying schedule.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.

B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC).

1.10 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

D. Deliver keys to Owner by registered mail or overnight package service.

1.11 WARRANTY

A. Special Warranty: 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 doors and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:

    a. Exit Devices: Two years from date of Substantial Completion.
    b. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 PERFORMANCE REQUIREMENTS

A. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design" .

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
3. 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 position of 12 degrees from the latch.
4. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.3 HINGES

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allegion plc.
    b. Hager Companies.

2.4 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Bored Locks: BHMA A156.2; Grade 1; Series 4000.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Allegion plc.
    b. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
    c. SARGENT Manufacturing Company; ASSA ABLOY.
    d. Stanley Commercial Hardware; a division of Stanley Security Solutions.

C. Mortise Locks: BHMA A156.13; Operational Grade 1 ; stamped steel case with steel or brass parts; Series 1000.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
b. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
c. SARGENT Manufacturing Company; ASSA ABLOY.
d. Yale Security Inc; an ASSA ABLOY Group company.

2.5 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. C.R. Laurence Co., Inc.
b. DORMA USA, Inc.
c. SARGENT Manufacturing Company; ASSA ABLOY.
d. Yale Security Inc; an ASSA ABLOY Group company.

2.6 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Allegion plc.
b. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
c. SARGENT Manufacturing Company; ASSA ABLOY.
d. Yale Security Inc; an ASSA ABLOY Group company.

2.7 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.

1. Master Key System: Change keys and a master key operate cylinders.

a. Provide three cylinder change keys and five master keys.

2.8 OPERATING TRIM

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

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Allegion plc.
b. Hager Companies.
c. Rockwood Manufacturing Company; an ASSA ABLOY Group company.

2.9 SURFACE CLOSERS

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

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Allegion plc.
b. Hager Companies.
c. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
d. SARGENT Manufacturing Company; ASSA ABLOY.

2.10 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.

2.11 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Pemko Manufacturing Co.
b. Reese Enterprises, Inc.
c. Zero International, Inc.

2.12 THRESHOLDS

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

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Pemko Manufacturing Co.
b. Reese Enterprises, Inc.
c. Zero International, Inc.

2.13 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-rating 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 indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
3. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.14 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as directed by Owner.
2. Furnish permanent cores to Owner for installation.

E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 92 00 "Joint Sealants."

F. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

1. Do not notch perimeter gasketing to install other surface-applied hardware.

G. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

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

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.8 DEMONSTRATION

A. Engage Installer to train Owner's maintenance personnel to adjust, operate, and maintain door hardware.

3.9 DOOR HARDWARE SCHEDULE

A. Refer to Drawings for Door Schedule and Door Hardware Legend.

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Glass for windows, doors, interior borrowed lites, storefront framing, and glazed curtain walls.
2. Glazing sealants and accessories.

1.2 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

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 responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Preconstruction adhesion and compatibility test report.

1.5 QUALITY ASSURANCE

A. Source: For each glass and glazing type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.

B. Installer: A firm with a minimum of three years' experience in type of work required by this Section and which is acceptable to manufacturers of primary materials. Installer is required to be factory trained for the glass & glazing systems being used on the project.

C. Glass Thickness: Determine and provide size and thickness of glass products that are certified to meet or exceed performance requirements specified in this Section. Provide units with proper thickness, edge clearance and tolerance to comply with recommendations of glass manufacturer.

D. Perform work in accordance with Flat Glass Manufacturer's Association (FGMA) Glazing Manual Sealant Manual.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

C. Manufacturer's Special Warranty for 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 Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in glass schedules or comparable product by one of the following:

1. Cardinal Glass Industries.
2. Guardian Industries Corp.; SunGuard.
3. Oldcastle Building Envelope.
4. Pilkington North America.
5. Viracon, Inc.
6. Vitro (formerly PPG Glass)

2.2 GLASS - GENERAL

A. General requirements for glass: Of domestic manufacture, conforming to the referenced standards and with the additional requirements specified herein; factory labeled on each pane stating the strength, type, thickness and quality; with all labels remaining on glass until final cleaning.

B. Fabricate glass as required to openings with edge clearances and bite on glass as recommended by the manufacturer with clean-cut edges where concealed, and smooth ground, polished and seamed edges where exposed to view. Do not cut, seam, nip or abrade glass after tempering.

1. For non-tempered to be cut at site, provide glass larger than required so as to obtain clean cut edges without seaming or nipping. Laminated glass products should not be cut on site.

C. Glass thickness shown and heat treatment specified are minimum requirements. Provide glass thickness and heat treatment as required to meet specified performance criteria, State and local codes and ordinances.

2.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazing.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings.
2. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. 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. 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.
2. 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.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.4 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.5 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.

C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

D. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.6 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Perimeter Spacer: Aluminum with mill or clear anodic finish.

2.7 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they 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.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

E. 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.

PART 3 - EXECUTION

3.1 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. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. 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.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.

G. 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.

3.2 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, 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. 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.

3.3 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.

3.4 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. 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.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

3.5 MONOLITHIC GLASS SCHEDULE

A. Glass Type "GL-1": Clear annealed float glass.

1. Minimum Thickness: 6 mm.
2. Safety glazing required where indicated.

B. Glass Type "GL-2T": "Safety Glass": Clear Fully-Tempered Float Glass.

1. Minimum Thickness: 6 mm.

3.6 INSULATING GLASS SCHEDULE

A. Glass Type: IG-1 : Clear low-e coated insulating glass.

1. Basis-of-Design Product: Solarban 90.
2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Heat-strengthened float glass.
5. Low-E Coating: Pyrolytic or sputtered on second surface.
6. Interspace Content: Air.
7. Indoor Lite: Heat-strengthened float glass.
8. Winter Nighttime U-Factor: 0.28 maximum.
9. Solar Heat Gain Coefficient: 0.23 or better.
10. Visible Light Transmission (VLT): 51%
11. Exterior Reflectance: 12%.
12. Tempered safety glazing required. See drawings for locations.

END OF SECTION 08 80 00

SECTION 09 29 00 - GYPSUM BOARD

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. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.

B. Related Requirements:

1. Section 06 16 00 "Sheathing" for gypsum sheathing for exterior walls.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing and finishing gypsum board systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paperless surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Gypsum.
    b. Georgia-Pacific Building Products.
    c. National Gypsum Company.
    d. Temple-Inland Building Products by Georgia-Pacific.
    e. USG Corporation.

2. Core: As indicated.
3. Thickness: 5/8"
4. Long Edges: Tapered.
5. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc .
2. Shapes:

    a. Cornerbead.
    b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    c. L-Bead: L-shaped; exposed long flange receives joint compound.
    d. U-Bead: J-shaped; exposed short flange does not receive joint compound.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

D. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: Vertical surfaces unless otherwise indicated.
2. Type X: Where required for fire-resistance-rated assembly.
3. Flexible Type: Apply in double layer at curved assemblies.
4. Ceiling Type: Ceiling surfaces.
5. Abuse-Resistant Type: As indicated on Drawings Insert requirements.
6. Mold-Resistant Type: As indicated on Drawings and plumbing chase walls.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for acoustical tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

4. Level 5: Where indicated on Drawings and at locations to receive vinyl or painted graphics..

    a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 093013 - CERAMIC TILING

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. Porcelain paver mosaic tile.
2. Porcelain paver tile.
3. Waterproof membrane for thinset applications.
4. Metal edge strips.
5. Solid surface thresholds.

B. Related Requirements:

1. Section 071326 "Self-Adhering Sheet Waterproofing" for waterproofing under thickset mortar beds.
2. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Face Size: Actual tile size, excluding spacer lugs.

D. Module Size: Actual tile size plus joint width indicated.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Full-size units of each type of trim and accessory for each color and finish required.
3. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of product.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
2. Obtain waterproof membrane, except for sheet products, from manufacturer of setting and grouting materials.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.3 TILE PRODUCTS

A. Indicated on Drawings.

B. Ceramic Tile Type PP-2: Factory-mounted glazed ceramic mosaic tile.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crossville, Inc. (Basis-of-Design)
b. Daltile.
c. Florida Tile, Inc.

2. Composition: Porcelain.
3. Certification: Porcelain tile certified by the Porcelain Tile Certification Agency.
4. Module Size: 2 by 2 inches.
5. Thickness: 10.5 mm.
6. Face: Plain with square edges.
7. Surface: Smooth, without abrasive admixture.

8. Dynamic Coefficient of Friction: Not less than 0.42.
9. Finish: Mat, opaque glaze.
10. Tile Color and Pattern: Refer to Drawings.
11. Grout Color: As selected by Architect from manufacturer's full range.

C. Ceramic Tile Type: Glazed porcelain paver tile. PP-1

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Crossville, Inc.(Basis-of-Design)
    b. Daltile.
    c. Florida Tile, Inc.

2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 12 by 24 inches.
4. Face Size Variation: Rectified.
5. Thickness: 10.5 mm.
6. Face: Plain with square edges.
7. Tile Color, Glaze, and Pattern: Refer to Drawings.
8. Grout Color: As selected by Architect from manufacturer's full range.
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

    a. Base Cap PP-1 BASE: Surface bullnose, module size 4 by 24 inches.

D. Ceramic Tile Type: Glazed porcelain paver tile. PP-3

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Crossville, Inc. (Basis-of-Design)
    b. Daltile
    c. Florida Tile, Inc.

2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 24 by 48 inches.
4. Face Size Variation: Rectified.
5. Thickness: 10.5 mm.
6. Face: Plain with square edges.
7. Tile Color, Glaze, and Pattern: Refer to Drawings.
8. Grout Color: As selected by Architect from manufacturer’s full range.
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Solid Surface Thresholds at Showers See Drawings for detail and designation.

2.5 WATERPROOF MEMBRANE (SHOWERS ONLY)

A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. LATICRETE SUPERCAP, LLC.
b. MAPEI Corporation.

2.6 SETTING MATERIALS

A. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.

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. Custom Building Products.
b. LATICRETE SUPERCAP, LLC.
c. MAPEI Corporation.

2. Provide prepackaged, dry-mortar mix containing dry, dispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. Provide prepackaged, dry-mortar mix combined with acrylic resin styrene-butadiene-rubber liquid-latex additive at Project site.

2.7 GROUT MATERIALS

A. Water-Cleanable Epoxy Grout: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ARDEX Americas.
b. Custom Building Products.
c. LATICRETE SUPERCAP, LLC.
d. MAPEI Corporation.

2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless steel, ASTM A276/A276M or ASTM A666, 300 Series exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Schluter Systems L.P.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors comply with surface finish requirements in ANSI A108.01 for installations indicated.

a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION OF CERAMIC TILE

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

    a. Tile floors in wet areas.
    b. Tile floors consisting of tiles 8 by 8 inches or larger.
    c. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in pattern indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Porcelain Paver Tile: 3 mm.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Solid Surface Thresholds at Showers: Install thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

K. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

3.4 INSTALLATION OF WATERPROOF MEMBRANE

A. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.5 INSTALLATION OF CRACK ISOLATION MEMBRANE

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.6 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Porcelain Tile Installation PP-1: TCNA F113; thinset mortar.

a. Porcelain Tile Type: PP-1.
b. Thinset Mortar: Improved modified dry-setmortar.
c. Grout: Water-cleanable epoxy grout.

2. Ceramic Tile Installation Insert designation: TCNA F122; thinset mortar on waterproof membrane.

a. Ceramic Tile Type: PP-2 in showers only.
b. Thinset Mortar: Improved modified dry-setmortar.
c. Grout: High-performance epoxygrout.

B. Interior Wall Installations, Masonry or Concrete:

1. Ceramic Tile Installation PP-1 BASE: TCNA W202; thinset mortar.

a. Porcelain Tile Type: PP-1 BASE.
b. Thinset Mortar: Improved modified dry-set mortar.
c. Grout: Water-cleanable epoxy grout.

END OF SECTION

SECTION 09 91 13 - 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. Concrete.
2. Steel and iron.
3. Galvanized metal.
4. Aluminum (not anodized or otherwise coated).
5. Plastic.
6. Gypsum board.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI 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. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. 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.
2. Indicate VOC content.

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 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.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified contractor shall have a minimum of five (5) years proven satisfactory experience and successfuf completions of projects of similar scope and shall show proof before commencement of work that he will maintain a qualified crew of painters throughout the duration of the work. When requested, Contractor shall provide a list of the last three comparable jobs including, name and location, specifying authority / project manager, start / completion dates and value of the painting work.

B. All materials, preparation and workmanship shall conform to requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute (MPI) (hereafter referred to as the MPI Painting Manual) as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver all painting materials in sealed, original labeled containers bearing manufacturer's name, brand name, type of paint or coating and color designation, standard compliance, materials content as well as mixing and/or reducing and application requirements.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Perform no painting or decorating work unless a minimum lighting level of 323 Lux (30 foot candles) is provided on surfaces to be painted or decorated.

D. Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces. Concrete and masonry surfaces must be installed at least 28 days prior to painting and must be visually dry on both sides.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Benjamin Moore & Co.
2. PPG Paints (Basis-of-Design).
3. Sherwin-Williams Company (The).

C. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. 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.

B. Colors: Match Architect's samples.

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. Exterior 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 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.

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 3.

F. 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.

G. 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.

H. Aluminum Substrates: Remove loose surface oxidation.

I. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification 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.

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. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:

a. Equipment, including panelboards and switch gear that do not have factory-applied final finishes.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.

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. Concrete, Portland Cement Plaster and Masonry other than CMU and Brick (Semi-gloss):

1. Primer (New) - 1 coat applied at DFT of no less than 1.5 mils or as recommended by manufacturer:

    a. PPG: 4-603XI Perma Crete Int/Ext Alkaline Resistant Primer.
    b. BM: Moore High Build Acrylic Masonry Primer 068.
    c. SW: Loxon Masonry Primer A24W300.

2. Primer (Previously Painted) - 1 coat applied at DFT of no less than 1.6 mils or as recommended by manufacturer:

    a. PPG: 17-921XI Seal Grip Interior Exterior Acrylic Universal Primer.
    b. BM: Moore Fresh Start Interior Exterior Acrylic Primer 023.
    c. SW: PrepRite ProBlock Interior/Exterior Latex Primer/Sealer B51-600 Series.

3. Finish - 2 coats applied at total DFT of no less than 2.8 mils or as recommended by manufacturer:

    a. PPG: 6-900XI Speedhide Exterior Acrylic Semi-Gloss.
    b. BM: Super Spec Latex Semi Gloss House & Trim paint K170 Series.
    c. SW: A-100 Exterior Acrylic Latex Gloss A8 Series.

B. Concrete Masonry Units (Semi-gloss):

1. Block Filler (New) - 1 coat applied at DFT of no less than 7.1 mils or as recommended by manufacturer:

    a. PPG: 6-7 Speedhide Interior Exterior Latex Block Filler.
    b. BM: Latex Block Filler M88 Series.
    c. SW: Prep-Rite Latex Block FillerB25W25.

2. Primer (Previously Painted) - 1 coat applied at DFT of no less than 1.6 mils or as recommended by manufacturer:

    a. PPG: 17-921XI Seal Grip Interior Exterior Acrylic Universal Primer.
    b. BM: Moore Fresh Start Interior Exterior Acrylic Primer 023.
    c. SW: PrepRite ProBlock Interior/Exterior Latex Primer/Sealer B51-600 Series.

3. Finish - 2 coats applied at total DFT of no less than 2.8 mils or as recommended by manufacturer:

    a. PPG: 6-900XI Speedhide Exterior Acrylic Semi-Gloss.
    b. BM: Super Spec Latex Semi Gloss House & Trim paint K170 Series.
    c. SW: A-100 Exterior Acrylic Latex Gloss A8 Series.

C. Exterior Insulation and Finish System (Flat):

1. Primer (New) - 1 coat applied at DFT of no less than 2.6 Ó 3.2 mils or as recommended by manufacturer:

    a. PPG: 4-603XI Perma Crete Int/Ext Alkaline Resistant Primer.
    b. BM: Moore High-Build Masonry Primer 068.
    c. SW: Loxon Masonry Primer A24W300.

2. Primer (Previously Painted) - 1 coat applied at no less than 0.7 Ó 1.3 mils or as recommended by manufacturer:

    a. PPG: 4-808/809 Perma-Crete Interior/Exterior Acrylic Masonry Surface Sealer.
    b. BM: Equal Product.

c. SW: Loxon Conditioner A24-100 series

3. Finish - 2 coats applied at total DFT of no less than 6.4 mils or as recommended by manufacturer:

a. PPG: 4-22XI Perma Crete High Build 100% Acrylic Topcoat.
b. BM: Equal Product.
c. SW: L oxon Masonry Coating A24W300 series.

D. Ferrous Metal (Semi-gloss):

1. Primer (New or Shop Primed) - 1 coat applied at DFT of no less than 2.3 mils or as recommended by manufacturer:

a. PPG: 6-208 Speedhide Int/Ext Rust Inhibitive Steel Primer.
b. BM: Super Spec HP Alkyd Metal Primer P06 Series.
c. SW: Kromik Alkyd Metal Primer E41 Series.

2. Primer (Previously Painted) - 1 coat applied at DFT of no less than 1.6 mils or as recommended by manufacturer:

a. PPG: 17-921XI Seal Grip Interior Exterior Universal Acrylic Primer.
b. BM: Moore Fresh Start Interior Exterior Acrylic Primer 023.
c. SW: PrepRite ProBlock Interior/Exterior Latex Primer/Sealer B51-600 Series.

3. Finish - 2 coats applied at total DFT of no less than 4.0 mils or as recommended by manufacturer:

a. PPG: 4216HP Pitt-Tech Plus Waterborne Acrylic DTM Semi-Gloss Enamel
b. BM: Super Spec HP DTM Acrylic Semi-Gloss Enamel P29 Series.
c. SW: DTM Acrylic Semi-Gloss Enamel B66W200.

E. Galvanized Metal (Semi-gloss):

1. Primer (New and Previously Painted) - 1 coat applied at DFT of no less than 2.0 mils or as recommended by manufacturer:

a. PPG: 90-712 Pitt-Tech DTM Acrylic Metal Primer Finish.
b. BM: Super Spec HP Acrylic Metal Primer P04.
c. SW: DTM Acrylic Primer Finish B66W1 Series.

2. Finish - 2 coats applied at total DFT of no less than 4.0 mils or as recommended by manufacturer:

a. PPG: 4216HP Pitt-Tech Plus Waterborne Acrylic DTM Semi-Gloss Enamel.
b. BM: Super Spec HP DTM Acrylic Semi-Gloss Enamel P29 Series.
c. SW: DTM Acrylic Semi-Gloss Enamel B66W200.

F. Exterior Wood (Wood Exterior Semi-Transparent Stain)

1. First Coat (New wood).

a. PPG: Flood: FLD 812 Flood Pro Series Semi-Transparent Acrylic Oil Stain. One coat applied at rate recommended on manufacturer’s tech data sheet.

2. Second Coat (New wood).

a. PPG: Flood: FLD 812 Flood Pro Series Semi-Transparent Acrylic Oil Stain. One coat applied at rate recommended on manufacturer’s tech data sheet.

END OF SECTION 09 91 13

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 interior substrates.

1. Concrete masonry units (CMUs).
2. Steel and iron.
3. Galvanized metal.
4. Gypsum board.
5. Concrete floor sealer.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming structural steel.
2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
3. Section 055113 "Metal Pan Stairs" for shop priming metal pan stairs.
4. Section 055213 "Pipe and Tube Railings" for shop priming pipe and tube railings.
5. Section 099600 "High-Performance Coatings" for tile-like coatings.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. 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.

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 square.
2. Apply coats on Samples in steps to show each coat required for system.

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. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified contractor shall have a minimum of five (5) years proven satisfactory experience and successful completions of projects of similar scope and shall show proof before commencement of work that he will maintain a qualified crew of painters throughout the duration of the work. When requested, Contractor shall provide a list of the last three comparable jobs including, name and location, specifying authority / project manager, start / completion dates and value of the painting work.

B. All materials, preparation and workmanship shall conform to requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute (MPI) (hereafter referred to as the MPI Painting Manual) as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver all painting materials in sealed, original labeled containers bearing manufacturer's name, brand name, type of paint or coating and color designation, standard compliance, materials content as well as mixing and/or reducing and application requirements.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Perform no painting or decorating work unless a minimum lighting level of 323 Lux (30 foot candles) is provided on surfaces to be painted or decorated.

D. Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces. Concrete and masonry surfaces must be installed at least 28 days prior to painting and must be visually dry on both sides.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Benjamin Moore & Co.
   2. PPG Architectural Coatings.
   3. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. 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.

B. Colors: As indicated in a color schedule.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

   1. Testing agency may perform tests for compliance with product requirements.
   2. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

   1. Concrete: 12 percent.
   2. 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 paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 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 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. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

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

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Masonry Units (Semi-gloss):

1. Block Filler (New) - 1 coat applied at DFT of no less than 7.1 mils or as recommended by manufacturer:
    a. PPG: 6-7 Speedhide Interior Exterior Latex Block Filler.
    b. BM: Latex Block Filler M88 Series.
    c. SW: Prep-Rite Latex Block FillerB25W25.
2. Primer (Previously Painted) - 1 coat applied at DFT of no less than 1.6 mils or as recommended by manufacturer:
    a. PPG: 17-921XI Seal Grip Interior Exterior Universal Acrylic Primer.
    b. BM: Moore's Fresh Start Interior Exterior Acrylic Primer 023.
    c. SW: PrepRite ProBlock Interior/Exterior Latex Primer/Sealer B51-600 Series.
3. Finish - 2 coats applied at total DFT of no less than 3.0 mils or as recommended by manufacturer:
    a. PPG: 16-510 Pitt Glaze WB1Pre Catalyzed Acrylic Semi-Gloss Epoxy.
    b. BM: Corotech Pre-Catalyzed Waterborne Epoxy Semi Gloss V341.

c. SW: Pro Industrial Precatalyzed Water based Epoxy, K46W151 series.

B. Concrete Masonry Units (Semi-gloss in wet environments – restrooms and showers):

1. Block Filler (New) - 1 coat applied at DFT of no less than 11.0 mils or as recommended by manufacturer:
   a. PPG: 95-217 Cementitious Waterproofing Epoxy Block Filler.
   b. BM: Super Spec Waterborne Epoxy Block Filler, P31.
   c. SW: Kem Cati-Coat HS Epoxy Filler/Sealer, B42W00400/B42V00401
2. Finish - 2 coats applied at total DFT of no less than 4.0 mils or as recommended by manufacturer:
   a. PPG: 98-1 Aquapon WB Water-Borne Polyamide Semi Gloss Epoxy.
   b. BM: Super Spec HP Waterborne Polyamide Epoxy Gloss, P42.
   c. SW: Water based Tile-Clad Epoxy Finish, B73-100 Series.

C. Ferrous Metal (Semi-gloss Standard Areas):

1. Primer (New and Previously Painted) - 1 coat applied at DFT of no less than 2.3 mils or as recommended by manufacturer:
   a. PPG: 90-708 Pitt Tech Int/Ext DTM Waterborne Rust Inhibitive Primer.
   b. BM: Super Spec HP Acrylic Metal Primer P04.
   c. SW: Pro Industrial DTM Acrylic Primer/Finish, B66W1 Series.
2. Finish - 2 coats applied at total DFT of no less than 3.0 mils or as recommended by manufacturer:
   a. PPG: 16-510 Pitt Glaze WB1Pre Catalyzed Acrylic Semi-Gloss Epoxy.
   b. BM: Corotech Pre-Catalyzed Waterborne Epoxy Semi Gloss V341.
   c. SW: Pro Industrial Precatalyzed Water based Epoxy, K46W151 series.

D. Ferrous Metal (Semi-Gloss for HANDRAILS):

1. Primer (New and Previously Painted) - 1 coat applied at DFT as recommended by manufacturer:
   a. PPG: 95-245 Pitt Guard Rapid Coat DTR Epoxy Mastic Coating
   b. BM: Corotech Surface Tolerant Epoxy Mastic Coating V160.
   c. SW: Macropoxy 646 Fast Cure Epoxy, B58W610 series.
2. Finish - 2 coats applied at total DFT as recommended by manufacturer:
   a. PPG: 95-245 Pitt Guard Rapid Coat DTR Epoxy Mastic Coating.
   b. BM: Corotech Surface Tolerant Epoxy Mastic Coating V160.
   c. SW: Macropoxy 646 Fast Cure Epoxy, B58W610 series.

E. Galvanized Metal (Semi-gloss Standard Areas):

1. Primer (New and Previously Painted) - 1 coat applied at DFT of no less than 2.0 mils or as recommended by manufacturer:
   a. PPG: 90-712 Pitt-Tech DTM Acrylic Metal Primer Finish.
   b. BM: Super Spec HP Acrylic Metal Primer P04.
   c. SW: DTM Acrylic Primer Finish B66W1 Series.
2. Finish: 2 coats applied at total DFT of no less than 3.0 mils or as recommended by manufacturer:
   a. PPG: 16-510 Pitt Glaze WB1Pre Catalyzed Acrylic Semi-Gloss Epoxy.
   b. BM: Corotech Pre-Catalyzed Waterborne Epoxy Semi Gloss V341.
   c. SW: Pro Industrial Precatalyzed Water based Epoxy, K46W151 series.

F. Gypsum Board (Flat):

1. Primer (New) - 1 coat applied at DFT of no less than 1.0 mils or as recommended by

manufacturer:
a. PPG: 6-4900XI Speedhide Zero Interior Zero VOC Latex Sealer.
b. BM: Ultra Spec 500 Interior Zero VOC Latex Primer 534.
c. SW: ProMar 200 Zero VOC Interior Latex Primer, B28W2600.

2. Primer (Previously Painted) - 1 coat applied at DFT of no less than 1.6 mils or as recommended by manufacturer:
a. PPG: 17-921XI Seal Grip Interior Exterior Universal Acrylic Primer.
b. BM: Moores Fresh Start Interior Exterior Acrylic Primer 023.
c. SW: PrepRite ProBlock Interior/Exterior Latex Primer/Sealer B51-600 Series.

3. Finish - 2 coats applied at total DFT of no less than 2.6 mils or as recommended by manufacturer:
a. PPG: 6-4110XI Speedhide Zero Interior Zero VOC Latex Flat Wall Paint.
b. BM: Ultra Spec 500 Zero VOC Interior Flat Latex N536.
c. SW: ProMar 200 Zero VOC Interior Flat, B30W2651 Series.

G. Gypsum Board (Eggshell):

1. Primer (New) - 1 coat applied at DFT of no less than 1.0 mils or as recommended by manufacturer:
a. PPG: 6-4900XI Speedhide Zero Interior Zero VOC Latex Sealer.
b. BM: Ultra Spec 500 Interior Zero VOC Latex Primer 534.
c. SW: ProMar 200 Zero VOC Interior Latex Primer, B28W2600.

2. Primer (Previously Painted) - 1 coat applied at DFT of no less than 1.6 mils or as recommended by manufacturer:
a. PPG: 17-921XI Seal Grip Interior Exterior Universal Acrylic Primer.
b. BM: Moores Fresh Start Interior Exterior Acrylic Primer 023.
c. SW: PrepRite ProBlock Interior/Exterior Latex Primer/Sealer B51-600 Series.

3. Finish - 2 coats applied at total DFT of no less than 3.0 mils or as recommended by manufacturer:
a. PPG: 6-4310XI Speedhide Zero Interior Zero VOC Latex Eggshell.
b. BM: Ultra Spec 500 Zero VOC Interior Eggshell Latex N537.
c. SW: ProMar 200 Zero VOC Low Sheen Egshell, B24 2600 Series.

H. Gypsum Board (Water based Polyamide Epoxy for High Abuse Areas):

1. Primer (New) - 1 coat applied at DFT of no less than 1.0 mils or as recommended by manufacturer:
a. PPG: 17-921XI Seal Grip Interior Exterior Universal Acrylic Primer.
b. BM: Moores Fresh Start Interior Exterior Acrylic Primer 023.
c. SW: PrepRite ProBlock Interior/Exterior Latex Primer/Sealer B51-600.

2. Primer (Previously Painted) - 1 coat applied at DFT of no less than 1.6 mils or as recommended by manufacturer:
a. PPG: 17-921XI Seal Grip Interior Exterior Universal Acrylic Primer.
b. BM: Moores Fresh Start Interior Exterior Acrylic Primer 023.
c. SW: PrepRite ProBlock Interior/Exterior Latex Primer/Sealer B51-600 Series.

3. Finish - 2 coats applied at total DFT of no less than 4.0 mils or as recommended by manufacturer:
a. PPG: 98-1 Aquapon WB Waterborne Semi Gloss Epoxy.
b. BM: Super Spec HP Waterborne Polyamide Epoxy Gloss, P42.
c. SW: Water based Tile-Clad Epoxy Finish, B73-100 Series.

3.7 Concrete Substrates, Traffic Surfaces:

1. Concrete Stain System:

a. Stain: Ameripolish Classic Dyes, Solvent-based system.
b. Sealer: Ameripolish SR WB Stain Resistor

END OF SECTION 099123

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

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. Cast dimensional characters, interior and exterior installation.

1.3 COORDINATION

A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For dimensional letter signs.

1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
2. Show message list, typestyles, graphic elements, and layout for each sign at least 1/2" = 1'-0" scale.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Exposed Accessories: Full-size Sample of each accessory type.

E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior , allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 DIMENSIONAL CHARACTERS

A. Cast Characters: Refer to Exterior Elevation Drawings. Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:

1. Thickness: Manufacturer's standard for size of character.
2. Finishes:

a. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.

3. Mounting: Concealed studs.
4. Typeface: As selected by Architect from manufacturer's full range.

2.3 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Internally brace signs for stability and for securing fasteners.

2.4 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 101423 - PANEL SIGNAGE

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. Panel signs.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Panel Signs: Full-size Sample.

D. Product Schedule: For panel signs. Use same designations indicated on Drawings or specified.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify locations of [anchorage devices] [and] [electrical service] embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in ICC A117.1 - 2017.

2.2 PANEL SIGNS

A. Panel Signs : Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

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. APCO Graphics, Inc.
b. Best Sign Systems, Inc..
c. Mohawk Sign Systems.
d. Commercial Engraving.

2. Solid-Sheet Sign: Acrylic sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph and as follows:

a. Thickness: 0.25 inch.
b. Sizes:

1) See Drawings.

c. Surface-Applied, Raised Graphics: Applied polymer characters and Braille.
d. All signs shall be square cut and have radius corners in elevation.

3. Surface Finish and Applied Graphics:

a. Integral Acrylic Sheet Color: As selected by Architect from full range of industry colors.

4. Text and Typeface: Accessible raised characters and Braille . Finish raised characters to contrast with background color, and finish Braille to match background color.
5. Flatness Tolerance: Sign shall remain flat or uniformly curved under installed conditions as indicated on Drawings and within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

B. Panel Signage: indicated on Door Schedule. See Drawings.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
3. Sign Mounting Fasteners:

a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
b. Projecting Studs: Threaded studs with sleeve spacer, screwed into back of sign assembly, unless otherwise indicated.

2.4 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.

B. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.

C. Signs with Changeable Message Capability (holder for fire evacuation maps): Fabricate signs to allow insertion of changeable messages as follows:

1. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Subsequent changeable inserts are by Owner.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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.

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. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Accessible Signage: Install in locations on walls according to the accessibility standard.

C. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

SECTION 10 28 00 - 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. Childcare accessories.
4. Custodial accessories.

1.3 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.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
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.

C. Delegated-Design Submittal: For grab bars.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 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: Five 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 concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Specialties, Inc.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.
   d. Insert manufacturer's name.

B. Toilet Tissue (Roll) Dispenser “TTD “:

1. Description: Double-roll dispenser.
2. Mounting: Surface mounted.
3. Operation: Spindleless with tension-spring controlled delivery.
4. Capacity: Designed for 4-1/2- or 5-inch- diameter tissue rolls.
5. Material and Finish: Satin-finish aluminum bracket with plastic spindle.

C. Soap Dispenser “SD”:

1. Description: Designed for manual operation and dispensing soap in liquid or lotion form.
2. Mounting: Vertically oriented, surface mounted.
3. Capacity: 40-ounces.
4. Lockset: Tumbler type.
5. Refill Indicator: Window type.

D. Grab Bar "GB18, GB36, GB42 ":

1. Mounting: Flanges with concealed fasteners.
2. 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.

3. Outside Diameter: 1-1/2 inches.
4. Configuration and Length: As indicated on Drawings.

E. Sanitary-Napkin Disposal Unit “SND ":

1. Mounting: Recessed Partition mounted, dual access Surface mounted.
2. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
3. Receptacle: Removable.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

F. Mirror Unit "M1":

1. Frame: Stainless steel angle, 0.05 inch thick Stainless steel channel Stainless steel, fixed tilt Stainless steel, adjustable tilt.

    a. Corners: Manufacturer's standard Mitered and mechanically interlocked Welded and ground smooth.

2. Size: As indicated on Drawings.

3. Hangers: Manufacturer's standard rigid, tamper and theft resistant Insert requirements.

2.3 HAND DRYERS

A. Source Limitations: Obtain hand dryers from single source from single manufacturer.

B. High-Speed Electric Hand Dryer 'EHD ':

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. American Specialties, Inc. (Basis of Design)
    b. Mitsubishi Electric Corporation.
    c. Sloan Valve Company.

2. Basis-of-Design Product: American Specialties, Inc. Model 20199 .
3. Mounting: Semi-Recess mounted.
4. Operation: Electronic-sensor activated with timed power cut-off switch.
5. Cover Material and Finish: 304 Stainless steel, No. 4 finish (satin).
6. Electrical Requirements: 115 V, 20 A, 1000 W.
7. Description: High-speed, warm -air hand dryer for rapid hand drying.

2.4 CHILDCARE ACCESSORIES

A. Source Limitations: Obtain childcare accessories from single source from single manufacturer.

B. Baby-Changing Station "BCS ":

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. American Specialties, Inc.
b. Bradley Corporation.
c. Koala Kare Products; a Division of Bobrick.

2. Description: Horizontal Vertical unit that opens by folding down from stored position and with child-protection strap.

a. Engineered to support minimum of 250-lb static load when opened.

3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed Semirecessed, with unit projecting not more than 1 inch from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: HDPE in manufacturer's standard color .
6. Liner Dispenser: Provide built-in dispenser for disposable sanitary liners.

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.

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 10 28 00

SECTION 10 44 13 - FIRE PROTECTION CABINETS

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. Fire protection cabinets for the following:

a. Portable fire extinguishers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.

1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.5 SEQUENCING

A. Apply vinyl lettering on field-painted, fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

2.2 FIRE PROTECTION CABINET "FEC"

A. Cabinet Type: Suitable for fire extinguisher.

1. Basis of Design Product: "FEC": Larsen's Manufacturing "Vertical Duo Clear #2409-6R with acrylic view window. Approximate outside dimensions 27" x 12 1/2" x 6" deep.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. J. L. Industries, Inc., a division of Activar Construction Products Group; .
b. Kidde Residential and Commercial Division, Subsidiary of Kidde plc; .
c. Larsen's Manufacturing Company; Basis-of-Design.

B. Cabinet Construction: Nonrated.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Steel sheet.

D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.

1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

E. Door Material: Steel sheet.

F. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting door pull and friction latch.
2. Provide manufacturer's standard hinge permitting door to open 180 degrees.

G. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."

1) Location: Applied to cabinet door.
2) Orientation: Vertical.

H. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:

a. Exterior of cabinet , door, and trim except for those surfaces indicated to receive another finish.
b. Interior of cabinet and door.

2.3 SECURITY FIRE PROTECTION KEY BOX

A. High-Security Key Lock Box: Suitable for storing keys for rapid access and emergency responders.

1. Basis-of-Design Product: Knox Company "Electronic Knox Box 3200.

a. Body Size: 4" H. x 6" W x 3-7/8" D.
b. Recessed Mounting Flange: 7" H x 7" W.
c. Capacity: 10 keys.
d. Electronic Lock: Knox eKey. Encrypted monitoring and wireless communication.

2.4 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.

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

3.2 PREPARATION

A. Prepare recesses for semirecessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13

SECTION 10 44 16 - 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 portable, fire extinguishers and mounting brackets for fire extinguishers.

B. Related Sections:

1. Division 10 Section "Fire Extinguisher Cabinets."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. 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 protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 QUALITY ASSURANCE

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.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 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 Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ansul Incorporated; Tyco International Ltd.
b. J. L. Industries, Inc.; a division of Activar Construction Products Group.
c. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
d. Larsen's Manufacturing Company.

2. Valves: Manufacturer's standard Nickel-plated, polished brass body.
3. Handles and Levers: Stainless steel.
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 Insert drawing designation: UL-rated 3-A:40-B:C 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

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 in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 10 44 16

SECTION 116823.11 - EXTERIOR COURT ATHLETIC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes exterior basketball equipment and tennis equipment.

B. Related Sections:

1. Section 321823 “Athletic Surfacing” for surfacing under and around exterior court equipment.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Extent of surface systems and use zones for equipment.
2. Critical heights for surfaces and fall heights for equipment.

B. Qualification Data: For qualified manufacturer.

C. Product Certificates: For each type of equipment, from manufacturer.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of playground equipment.

E. Field quality-control reports.

F. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For equipment and finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers approved by manufacturer.

B. Safety Standards: Provide equipment complying with or exceeding requirements.

C. Pre-installation Conference: Conduct conference at Project site.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of equipment that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TENNIS EQUIPMENT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ball Product, Inc.
2. Century Sports, Inc.
3. Douglas Industries, Inc.
4. Gamma Racquet Sports, Inc.
5. Edwards Tennis Products
6. Hartru LLC
7. Courtmaster Putterman Athletics

B. Posts: Externally, Internally wound with self-locking gear mechanism to prevent recoil during winding.

1. Provide 2 7/8-inch o.d. round 11 gage galvanized steel post with chrome plated gear plate, complete with welded lacing rods and round galvanized steel sleeves.
2. Provide plated gears for rust resistance, with case-hardened small gear to prevent jamming. Gear ratio to be 30:1.
3. Provide removable handle and cast aluminum caps and gear housings.
4. Provide powder-coated acrylic urethane exterior finish in black color.
5. Provide one of the following:

a. “Tournament External Wind” by Ball Products, Inc., 800-922-4540.
b. "Premier RD" by Douglas; (800) 553-8907.
c. "Royale Net Post" by Century Sports, Inc.; (800) 526-7548.

C. Net Material: Weatherproof, 3.5 mm braided solid-core polyethylene, UV resistant, conforming to USTA regulations.

1. Provide 3.0 Double by Duranet or equal.
2. Top Binding: 4-ply, UV-resistant, vinyl coated polyester with 4-row lock-stitching; bottom edges turned under for smooth finish.
3. Side Pockets and Bottom Tape: 18-oz. vinyl coated polyester with 2-row lock-stitched, side bands turned under.
4. Support Cable: 47-foot long, 5/32" galvanized steel cable, vinyl coated to 1/4", with 3700-lb. breaking strength.

5. Tie Strings: Polyethylene with minimum tensile strength of 1700 pounds, not less than 60 inches long, located at each corner of net to secure net to posts.
6. Lacing Twine: Material to match tie strings, not less than 96 inches long; one piece for each side binding.
7. Netting: 3.5 mm braided polyethylene net body. The net features a tapered fit (42-36-42 x 42 inch) and the top six rows are double netted. The net has a fiberglass dowel (7/16 x 39 inch) in each end to reinforce net when tied to net post.
8. Warranty: Five years.

D. Ground Anchor and Center Strap

1. 1-1/2-inch diameter, 10-gauge galvanized pipe, 10 inches long.
2. ¼ inch stainless steel pin.
3. Heavy duty polyester webbing with reinforced ends.
4. Brass slide buckle with back oxide coating.
5. Nickel-plated double end snap.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, site surface and subgrade drainage, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading required for placing protective surfacing is completed unless otherwise permitted by Architect.

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

3.2 PREPARATION

A. Verify locations of court perimeter(s) and pathways. Verify that layout and equipment locations comply with requirements for each type and component of equipment.

3.3 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Anchor equipment securely, positioned at locations and elevations indicated.

1. Maximum Equipment Height: Coordinate installed heights of equipment and components with finished elevations of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that equipment elevations comply with requirements for each type and component of equipment.

B. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.

C. Post Set on Subgrade: Level bearing surfaces with drainage fill to required elevation.

D. Post Set with Concrete Footing: Comply with ACI 301 for measuring, batching, mixing, transporting, forming, and placing concrete.

1. Set equipment posts in concrete footing. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.

    a. Place concrete around posts and vibrate or tamp for consolidation. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

2. Embedded Items: Use setting drawings and manufacturer's written instructions to ensure correct installation of anchorages for equipment.
3. Concrete Footings: Smooth top, and shape to shed water.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections: For court equipment and components during installation and at final completion and to certify compliance.

D. Prepare test and inspection reports.

E. Notify Architect 48 hours in advance of date and time of final inspection.

END OF SECTION 116823.11

SECTION 12 36 61.16 - SOLID SURFACING COUNTERTOPS

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. Solid surface material countertops.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA "SS-1".

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Avonite Surfaces.
b. E. I. du Pont de Nemours and Company Product: Corian.
c. Samsung Chemical USA, Inc.
d. Transolid Div of Trumbull Industries.

3. Type: Provide Standard type[or Veneer type made from material complying with requirements for Standard type, as indicated] unless Special Purpose type is indicated.

2.2 COUNTERTOP FABRICATION

A. Joints: Fabricate countertops in sections for joining in field.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

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

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

D. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

E. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 12 36 61.16

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers all work associated with the removal of trees and vegetation and the disposal of such material.

1.2 DEFINITIONS

A. Clearing: The felling, trimming, cutting and disposal of trees and other vegetation to include brush.

B. Grubbing: The removal and disposal of roots, matted roots, stumps, organic and metallic debris, and refuse to a depth not less than 18 inches.

C. Saleable Timber: Felled trees which could be used as saw logs, pulpwood, posts, poles, ties or fuel wood.

D. Non-Saleable timber: Timber, scrub, vegetation and other debris considered as nonsaleable.

E. Tree: Any living, self-supporting, woody perennial plant.

1. Diameter Breast Height (DBH): The diameter of a tree measured at breast height (four and one-half feet above ground)

F. Protective barricade: A physical structure not less than four feet in height, limiting access to a tree.

1.3 SUBMITTALS

A. None this Section

1.4 REGULATORY REQUIREMENTS

A. Comply with federal, state, and local regulations.

B. Comply with the requirements of the land disturbance permit and approved plans issued for this project by South Carolina Department of Health and Environmental Control (SCDHEC) and/or the MS4.

C. No material will be burned.

1.5 CRITERIA FOR BIDDING

A. Lump Sum Bid

1. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which is it associated and shall be included in the lump sum price. The price shall be full compensation for all material, equipment, labor, testing, construction supervision and all other work required for satisfactory completion of clearing and grubbing.

B. Unit Prices

1. None this Section.

1.6 QUALITY ASSURANCE

A. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.

B. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CLEARING

A. Clearing shall consist of the felling and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring within the area to be cleared. Trees, stumps roots, brush and other vegetation in areas to be cleared shall be burned or removed completely from the site to an area designated by the Owner, except such trees and vegetation as may be indicated or directed to be left standing.

B. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inches or more in diameter. Limbs and branches to be trimmed shall be neatly cut close to the hole of the tree or main branches. Cuts more than 1-1/2 inches in diameter thus made shall be painted with a tree wound paint.

C. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations, by erection of timber barriers or by such other means as circumstances require. Such barriers must be placed and be approved by the Engineer before construction activities can proceed.

D. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work.

E. Clearing operations shall be conducted so as to prevent damage by falling trees to trees left standing, to existing structures and installation, and to those under construction, and so as to provide for the safety of employees and others.

3.2 GRUBBING

A. Grubbing shall consist of the removal and disposal of stumps, roots larger than ¼ inches in diameter, and matted roots from the designated grubbing areas. This material, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be excavated and removed to a depth of not less than 18 inches below the original surface level of the ground in embankment areas and not less than 2 feet below the finished earth surface in excavated areas.

B. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground at no additional cost to the Owner.

3.3 TREE REMOVAL

A. Where indicated or directed, trees and stumps shall be removed from areas outside those areas designated for clearing and grubbing. The work shall include felling of such trees and the removal of their stumps and roots. Trees shall be disposed of as specified.

3.4 DISPOSAL

A. Disposal of trees, branches, snags, brush, stumps, etc., resulting from the clearing and grubbing shall be the responsibility of the Contractor and shall be disposed of and removed from the site.

B. All liability of any nature resulting from the disposal of the cleared and grubbed material shall become the responsibility of the Contractor.

C. All costs in connection with disposing of the material will be at the Contractor's expense.

3.5 PROTECTION

A. Existing Tree Protection

1. All trees on the site will be saved except those marked specifically for removal. No trees, either those marked for removal on the site or any other tree, may be removed from the site prior to the preconstruction conference.
2. All trees not to be removed will be protected from injury to their roots and to their top to a distance (3') three feet beyond the drip line and no grading, trenching, pruning, or storage of materials may go in this area.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers all work associated with stripping, subgrade preparation, filling, backfilling, compaction and disposition of surplus soil materials.

1.2 DEFINITIONS

A. Subgrade: Existing, in-situ soil or other material that is remaining after stripping or excavation. The subgrade is always existing material on which fill, or new structures are to be placed.

B. Excavation: The removal of soil or material to obtain a specified depth or elevation.

C. Borrow: Material that must be transported to the site. A material that must be developed by others and transported to the site. Not available on site.

D. Fill: Soil or material placed above the subgrade to the point of new construction such as a sub-base, base course, pavement, foundation, footing, or building component.

E. Backfill: Fill material used in refilling a cut, trench or other excavation.

F. Lift: A layer or course of material placed on top of a previously prepared or placed material.

G. Rock: Solid, homogeneous interlocking crystalline material with firmly cemented, laminated or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe mounted pneumatic hole punchers or rock breakers; also, large boulders, buried masonry, or concrete other than pavement, exceeding 25 cubic yards in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

H. Topsoil: In natural or undisturbed soil formations, the fine grained, weathered material on the surface or directly below any loose or partially decomposed organic matter. Topsoil may be dark-colored, fine, silty or sandy material with a high content of well decomposed organic matter, often containing traces of the parent rock material. The material shall be representative of productive soils in the vicinity.

I. Unsuitable Material: Existing, in situ soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability. Materials classified as PT, OH, or OL by ASTM D 2487 are unsuitable. Unsuitable materials also include man-made fills, refuse, frozen material, uncompacted backfills from previous construction, unsound rock or soil lenses, or other deleterious or objectionable material.

J. Granular Material: Soils classified as GW, GP, SW or SP by ASTM D 2487. Materials classified as GM and SM will be identified as granular only when fines have a plasticity index of zero.

K. Compaction: The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. “Degree of Compaction” is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D 698 (Standard Proctor Compaction Test) for general soil types, abbreviated in this specification as “___ percent maximum density.”

1.3 SUBMITTALS

A. Plans

1. Dewatering Plan: Describe methods for removing collected water from open trenches and diverting surface water or piped flow away from work area. Describe equipment and procedures for installing and operating the dewatering system indicated. Describe the basic components of the dewatering system proposed for use and its planned method of operation. Record performance and effectiveness of method or system in use. The dewatering plan shall address, as a minimum, the requirements identified in the paragraph titled “Drainage and Dewatering”

2. Shoring and Sheeting Plan: Describe the materials of the shoring system to be used. Indicate whether or not components will remain after filling or backfilling. Provide plans, sketches, or details along with calculations by a professional engineer. Indicate sequence and method of installation and removal.

B. Certifications

1. Independent Laboratory
2. Material Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for the following:

    a. Topsoil
    b. Gravel
    c. Sand

C. Laboratory Testing: Submit testing data as identified in the paragraph titled “Laboratory Testing” for any of the following materials to be used on the project. Obtain approval before any material is delivered to the site.

1. Subgrade
2. Common fill
3. Controlled fill
4. Granular fill

D. Field Testing: Submit field testing data as identified in the paragraph titled “Field Testing” for the following:

1. Subgrade compaction & density
2. Excavation compaction & density
3. Fill/backfill compaction & density

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

1.5 REGULATORY REQUIREMENTS

A. Materials and workmanship specified herein with reference to SC DOT State Standards shall be in accordance with the referenced article or section of the standard except that contractual and payment provisions do not apply. Where the term “State” is used, it shall mean “Owner.”

B. Comply with federal, state, and local regulations.

C. Comply with the requirements of the land disturbance permit and approved plans issued for this project by South Carolina Department of Health and Environmental Control (SCDHEC) and/or the MS4.

1.6 CRITERIA FOR BIDDING

A. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which is it associated and shall be included in the lump sum price. The price shall be full compensation for the removing and replacing of topsoil and all excavating, filling, transporting of material, compaction, shaping, finishing, dressing, disposal of surplus material, testing, staking, construction supervision and all other work required for satisfactory completion of the grading operation. The building pad shall include all areas to 10' outside the building wall and the area under all footings including trench walls and bottom. Also included in this price shall be that necessary to complete the grubbing and root raking operation as required by this section and elsewhere. Base bids on the following criteria:

1. Surface elevations as indicated.
2. No pipes or other man-made structures other those indicated will be encountered. The utility locations shown are based on available information and are approximate and shall be field verified prior to beginning any work.
3. Borrow material in the quantities required are not available on site and must be developed and obtained by the Contractor.

B. Unit Prices

1. None in this section.

1.7 QUALITY ASSURANCE

A. Materials: The Contractor will furnish the Engineer and Owner a description of all materials before ordering. The Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.

B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.

C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.

D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.

E. Testing Agencies: Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test. Agencies to be used shall be submitted to the Engineer for review prior to engagement.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Provide materials free from debris, roots, wood, scrap materials, vegetable matter, refuse or frozen material. Maximum particle size permitted is 3 inches. Use excavated material from the site for the work indicated when material falls within the requirements specified herein. When materials available on site do not meet the quantity required nor the requirements specified herein, the Contractor shall obtain borrow materials from off-site.

1. Onsite materials are suitable as structural fill. However, the high plasticity soils encountered in the Geotechnical Report should blended with lower plasticity soils and placed in accordance with the report. Some moisture conditioning shall be anticipated in order to obtain the required compaction.
2. Common Fill: Provide a soil material from the site or borrow that can be readily compacted to the specified densities. Materials shall be unclassified. Soft, spongy, highly plastic, or otherwise unsuitable material is prohibited. Material shall be unclassified but shall contain sufficient fines to ensure proper compaction.
3. Controlled Fill: Provide materials classified as GW, GP, GM, SW, SP, SM, SC, ML and CL, by ASTM D 2487 where indicated. The liquid limit of such material shall not exceed 50 percent when tested in accordance with ASTM D 4318. The plasticity index shall not be greater than 25 percent when tested in accordance with ASTM D 4318.
4. Controlled fill should exhibit a maximum dry density of at least 90 pcf as determined by a standard proctor compaction test (ASTM D-698).
5. Granular Fill: A dense, well graded aggregate mixture of sand, gravel or crushed stone mixed individually, in combination with each other, or with suitable binder soil. Granular fill may also consist of poorly graded sands or gravels.
6. Gravel: Clean, coarsely graded natural gravel, crushed stone or a combination thereof classified as GW or GP in accordance with ASTM D 2487 as indicated. The maximum particle size shall not exceed 3 inches
7. Sand: Clean, coarse-grained sand classified as SW or SP by ASTM D 2487 as indicated.
8. Topsoil: Salvaged topsoil form stockpile created during stripping operations. Add necessary soil modifiers to bring material within the ranges specified in Table 1 Furnish additional topsoil meeting the requirements in Table 1 if stockpiled material is insufficient to complete the work indicated.
9. Soil materials shall be free of subsoil, stumps, roots larger than ¾ inch in diameter (with maximum 3 percent retained on the ¼ inch sieve, brush, weeds, toxic substances, and other material or substance detrimental to plant growth.

TABLE 1

DOA SSIR Soil Survey Investigation Report No. 1, Laboratory Test for	Acceptable Limits
Sand Content	20 - 45 percent by weight
Silty Content	25 - 50 percent by weight
Clay Content	10 - 30 percent by weight
Organic Material (Walkley-Block)	5 percent
Ph	5.0 to 7.6
Soluble Salts	600 ppm maximum
Absorption Rate	0.5 inch per hour minimum

2.2 GEOTEXTILE FABRICS

A. Filter Fabric

1. Provide a pervious sheet of polyester, nylon, glass or polypropylene, ultraviolet resistant filaments woven, spun bonded, fused, or otherwise manufactured into a nonraveling fabric with uniform thickness and strength. Fabric shall have the following manufacturer certified minimum average roll properties as determined by ASTM D4759:

TABLE 2: Minimum Average Roll Properties

	Class A	Class B
Grab Tensile Strength ASTM D 4632 Machine and Transversed Direction	min. 180	80 lbs
Grab Elongation ASTM D 4632 Machine and Transverse Direction	min. 15	15 percent
Puncture Resistance ASTM D 4833	min. 80	25 lbs.
Mullen Burst Strength ASTM D 3786	min. 290	130 psi
Trapezoidal Tear ASTM D 4533	min. 50	25 lbs
Apparent Opening Size:	See Criteria Below	
Soil with 50 percent or less particles by weight passing US No. 200 Sieve, AOS less than 0.6 mm (greater than #30 US Std. Sieve)		
Soil with more than 50 percent particles by weight passing US No. 200 Sieve, AOS less than 0.297 mm (greater than #50 US Std. Sieve)		
Permeability ASTM D 4491	k fabric greater than k Soil	
Ultraviolet Degradation ASTM D 4355	70 percent Strength	Retained at 150 hrs

PART 3 - EXECUTION

3.1 STRIPPING

A. Perform clearing and grubbing operations as specified in Section “SITE CLEARING”.

B. Strip topsoil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as topsoil may be used for common fill provided that those requirements are met. Locate topsoil so that material can be used readily for the finished grading. Protect and store in segregated piles until needed.

3.2 EXCAVATIONS

A. Excavate to contours and dimensions indicated. Keep excavations free from water while construction is in progress. Notify the Engineer immediately in writing in the event that it becomes necessary to remove rock, hard material, or other material defined as unsuitable to a depth greater than indicated. Refill excavations cut below the depths indicated with controlled fill and compact as specified herein. Excavate soil disturbed or weakened by construction operations or soils softened from exposure to weather. Refill with controlled fill or concrete and compact as specified herein.

B. Excavations for Structures and Spread Footings

1. Excavate to depth indicated. If excavation is deeper than indicated, then fill with concrete when the foundations or footings are placed or backfill with controlled fill material prior to placement of footings.

C. Pile Supported Foundations

1. Excavate to elevation of bottom of pile cap. Backfill and compact over excavations and changes in grade due to pile driving operations in accordance with the requirements for filling and backfilling for structures. Place and compact backfill adjacent to pile caps in a manner that prevents displacement of the pile cap.

D. Disposal of Excavated Material

1. Surplus or other soil material not required or suitable for filling, backfilling, or embankment shall be removed from the property. Comply with all federal, state and local laws regarding the transportation and disposal of such material.
2. Dispose of excavated material in such a manner that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of facilities, or be detrimental to any property or work.

3.3 PREPARATION OF SUBGRADE

A. Subgrade Proof Rolling

1. After removal of topsoil or other overburden, proof roll the existing subgrade with six passes of a minimum 15 ton pneumatic-tired roller. Operate the roller in a systematic manner to assure the number of passes over all areas, and at speeds between 2.5 and 3.5 miles per hour.
2. When proof rolling under structures, one-half of the passes made with the roller shall be in a direction perpendicular to the other passes.
3. Rutting or pumping shall indicate unsuitable material and that material shall be undercut as directed by the Engineer, to a depth of 24 inches, and replaced with the appropriate fill material. Unsuitable material removal shall be done in accordance with the paragraph titled “Excavations.”
4. Perform proof rolling only when weather conditions permit. Do not proof roll wet or saturated subgrades. Materials degraded by proof rolling a wet or saturated subgrade shall be replaced by the Contractor as directed by the Engineer at no cost to the Owner.
5. Proof rolling shall be done in the presence of the Engineer. Notify the Engineer 3 days prior to proof rolling.

B. Preparation of Subgrade

1. Scarify the underlying subgrade surface to a depth of 6 inches before the fill is started. Step, bench, or break up sloped surfaces steeper than one vertical to 4 horizontal so that the fill material will bond with or be securely keyed to the existing material. Scarify existing surface to a minimum depth of 6 inches if subgrade density is less than the degree of compaction specified and recompact.
2. When the subgrade is part fill and part excavation or natural ground, scarify the excavated or natural ground portion to a depth of 12 inches and recompact as specified for the adjacent or overlying fill. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.

C. Compaction of Subgrade

1. The subgrades shall be compacted to the following maximum densities:

Location	Percent Maximum Dry Density
Under sidewalks and grassed areas	95
Under building slabs, foundations, footings, pavements and base courses (Greater than 24 inches below bottom of structure or pavement)	95
Under building slabs, foundations, footings, pavements and base courses (Less than 24 inches below the bottom of structure or pavement)	100

2. Protect subgrade from excessive wheel loading during construction, including concrete trucks and dump trucks.
3. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of a material equal to or better than best subgrade material on site.
4. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross section. Maintain subgrade for area to be paved and building pad subgrade, whether previously graded by

others and accepted by Contractor or constructed by Contractor. Make adjustments that may be required in accordance with the Specifications at no additional expense to the Owner.

D. Tolerances

1. Grade to finished grades indicated within 0.10 foot. Grade area to drain water away from structures. Existing grades which are to remain but are disturbed by the Contractor's operations shall be restored to original condition.
2. Finish surface of subgrade to the elevation and cross section indicated. Finished surface shall be smooth and of uniform texture. Lightly scarify or blade the finished surface to bring the finished surface to within 0.10 foot of the indicated grade and to eliminate imprints made by compaction and shaping equipment. Surface shall show no deviations in excess of ½ inch when tested with a 10-foot straightedge.
3. Finished subgrade shall be verified to ensure proper elevation for construction above subgrade. Grading of building and pavement areas shall be checked by string line from grade stakes (blue tops) set at not more than 50' centers. Contractor is to provide engineering and field staking necessary for verification of lines, grades, and elevations.

3.4 FILL AND BACKFILL

A. Place required fill and backfill material adjacent to structures and compact in a manner that prevents wedging action or eccentric loading upon or against the structures.

B. Step or serrate slopes bounding or within areas to be filled or backfilled to prevent sliding of the fill.

C. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction and slopes with the equipment used. Do not place material on surfaces that are muddy, frozen, or contain frost.

D. Do not use equipment for filling or backfilling operations or for the formation of embankments against structures that will overload the structure. Filling or backfilling against structures will be done only after the structure has attained sufficient strength to withstand the loads anticipated during and after backfilling operations.

E. Fill and backfill operations shall be performed with the following materials:

1. Common Fill

a. Construct fill backfill and embankment at the locations and to lines and grades indicated. Use only approved materials in constructing fill on the prepared subgrade. Place satisfactory material in horizontal lifts not exceeding 8 inches in loose depth. Do not place material on surfaces that are muddy, frozen, or contain frost. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction and slopes with the equipment used. Compact each lift as specified before placing the overlaying lift.

2. Controlled Fill

a. Place controlled fill under footings, concrete slabs not pile supported, structures, pavements and where indicated in maximum loose lifts of 8 inches. Do not place material on surfaces that are muddy, frozen, or contain frost. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction and slopes with the equipment used. Compact each lift as specified herein before placing the overlaying lift. Compaction shall be accomplished continuously over the entire area. Sufficient passes shall be made to ensure that specified density is obtained.

3. Granular Fill, Gravel and Sand

a. Granular fill, gravel and sand shall be placed where indicated. Do not dump material, but place in maximum loose 12-inch lifts and compact as indicated.

F. Compaction of Fill/Backfill

1. Fill and backfill shall be compacted to the following maximum densities:

Location	Percent Maximum Dry Density
Under sidewalks and grassed areas	95
Under building slabs, foundations, footings, pavements and base courses (Greater than 24 inches below bottom of structure or pavement)	95
Under building slabs, foundations, footings, pavements and base courses (Less than 24 inches below the bottom of structure or pavement)	100

Compact soils at or near the optimum moisture content (+/- 2%)

2. Protect compacted fill from excessive wheel loading during construction, including concrete trucks and dump trucks. Remove areas of compacted fill found to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of a material meeting the specifications. Surface of compacted fill after compaction shall be hard, uniform, smooth, stable, and true to grade and cross section. Maintain compacted fill for area to be paved and building pad subgrade, whether previously graded by others and accepted by Contractor or constructed by Contractor. Make adjustments that may be required in accordance with the Specifications at no additional expense to the Owner.

G. Tolerances

1. Grade to finished grades indicated within 0.10 foot. Grade area to drain water away from structures. Existing grades which are to remain but are disturbed by the Contractor's operations shall be restored to original condition.
2. Finish surface of fill or backfill to the elevation and cross section indicated. Finished surface shall be smooth and of uniform texture. Lightly scarify or blade the finished surface to bring the finished surface to within 0.10 foot of the indicated grade and to eliminate imprints made by compaction and shaping equipment. Surface shall show no deviations in excess of ½ inch when tested with a 10-foot straightedge

3.5 TOPSOIL

A. Clear areas to receive topsoil for the finished surface of materials that would interfere with planting and maintenance operations. Scarify subgrade to a depth of 2 inches. Do not place topsoil when the subgrade or fill is frozen, extremely wet or dry, or in other conditions detrimental to seeding, planting, or grading. Spread topsoil to a uniform depth of 4 inches over the designated areas

3.6 PROTECTION

A. Shoring and Sheeting

1. The Contractor is responsible for the design of all shoring and sheeting systems. Provide shoring, bracing or sheeting where required. In addition to the requirements of Section 25 A and B of COE EM-385-1-1, and other requirements of this contract meet the following:

a. Prevent the undermining of pavements, foundations and slabs.
b. Slope banks where space permits.

c. Where shoring and sheeting materials remain in place in completed work to prevent settlements or damage to adjacent structures as directed, backfill the excavation to 3 feet below the finished grade and remove the remaining portion of the shoring before completing the backfill.

B. Drainage and Dewatering

1. Plan for and provide structures, equipment and construction for the collection and disposal of surface and subsurface water encountered during construction.

a. Drainage

1) Dispose of surface water which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces.
2) Surface dewatering plan shall include rerouting of any storm water runoff or natural drainage if necessary.
3) Collect and dispose of surface and subsurface water encountered in the course of construction.

b. Dewatering

1) Groundwater flowing toward or into excavations shall be controlled to prevent sloughing or excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction.
2) French drains, sumps, ditches or trenches will not be permitted within three feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made.
3) Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in-situ material. While the excavation is open, the water level shall be maintained continuously, at least one foot below the working level.
4) Operate the dewatering system continuously, 24 hours per day, 7 days per week until construction work below existing water levels is complete. Have a back-up pump and system available for immediate use.

C. Erosion Control

1. Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the contract drawings and as required to prevent sedimentation of downstream features.

D. Existing Utilities

1. All known utility facilities are shown schematically on the plans and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown on plans will not relieve the Contractor of his responsibility under this requirement. “Existing Utilities Facilities” means any utility that exists on the project in its original, relocated or newly installed position. The Contractor will be held responsible for the cost of repairs to damaged underground facilities; even when such facilities are not shown on the plans.
2. The Contractor shall contact all utility companies prior to beginning work and request accurate field location of their respective utility lines.
3. Movement of construction machinery and equipment over pipes during construction shall be at the Contractor’s risk. Repair or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

E. Structures and surfaces

1. Graded areas shall be protected from traffic, erosion, settlement, or any washing away that may occur from any cause prior to acceptance.
2. Any repair or reestablishment of final grades shall be made prior to final acceptance.

3.7 INSPECTION AND TESTING

A. Inspections

1. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.
2. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours notice for all required observations or tests.

B. Testing

1. All testing shall be made at the Owner's expense. The Engineer shall approve test locations.
2. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.
3. The testing laboratory, Engineer, and Owner shall be given a minimum of 72 hours notice for all tests.
4. Laboratory testing

    a. Independent Testing laboratory shall operate in accordance with ASTM E 329 (latest edition) and shall be submitted to the engineer for approval.
    b. Laboratory testing for maximum density and optimum moisture content shall be performed in accordance with ASTM D 698 (Standard Proctor Compaction Test) for general soil types..
    c. Laboratory testing for mechanical analysis shall be performed in accordance with ASTM D 2487.
    d. Laboratory testing for plasticity index shall be performed in accordance with ASTM D 4318
    e. Frequency of laboratory testing

        1) Native soil subgrade - One maximum density, optimum moisture content, mechanical analysis and plasticity index test for each material encountered that will serve as subgrade.
        2) Fill/Backfill - One maximum density, optimum moisture content, mechanical analysis and plasticity index for each source and type of material to be used.
5. Field testing

    a. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. The Owner, Engineer, and Contractor shall be provided copies of reports within 72 hours of the time the test was performed. In the event that any test performed fails to meet these specifications, the Owner, Engineer and Contractor shall be notified immediately by Independent Testing Laboratory. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary. The Contractor shall provide free access to the site for testing activities.
    b. Field density tests for in-place materials shall be performed in accordance with one of the following:

        1) Sand Cone Method - ASTM D 1556
        2) Balloon Method - ASTM D 2167
        3) Nuclear Method - ASTM D 6938
        4) Drive-Cylinder Method – ASTM D2937

c. Frequency of field testing

1) Subgrade

a) One test per 5,000 square feet within building footprint (minimum of 2)
b) One test per 1,000 square yards of pavement (minimum of 3)
c) One test per 250 linear feet of footing (minimum of 4 - one each face of building)

2) Fill/Backfill

a) One test per 5,000 square feet per lift within building footprint (minimum of 2 per lift)
b) One test per 1,000 square yards of pavement per lift (minimum of 3 per lift)
c) One test per 250 linear feet of footing (minimum of 4 - one each face of building

C. Acceptance

1. In the event that a tested material does not meet or exceed the specified requirements, the Contractor shall perform additional testing as directed by the Engineer to adequately define the limits of the material not meeting the specifications. Materials shall be re-tested to the satisfaction of the Engineer until specified requirements are met.
2. All additional testing and work, which is the result of a failed test, shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 312000

SECTION 312523 - EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Installation of temporary and permanent erosion and sedimentation control systems.
2. Stormwater Pollution Prevention Plan (SWPPP) prepared by ADC Engineering, Inc., dated March 09, 2023, is appended to this Document.

1.2 REFERENCES

A. South Carolina NPDES General Permit for Stormwater Discharges from Construction Activities, (SCR100000).

B. MS4 (York County) Stormwater Design Standards

1.3 DEFINITIONS

A. *Comprehensive* Stormwater Pollution Prevention Plan (C-SWPPP) - A Stormwater Pollution Prevention Plan (SWPPP) which is prepared to obtain coverage under the NPDES Construction General Permit (CGP). The C-SWPPP must be submitted with the Notice of Intent (NOI) application and must include an Engineering Report (project design calculations). This document must be submitted and approved by SCDHEC, regulated MS4 entity, or an approved entity with Permitting Authority prior to obtaining coverage under this permit.

B. *On-Site* Stormwater Pollution Prevention Plan (OS-SWPPP) – The OS-SWPPP is a condensed version of the C-SWPPP and is stored on site. The OS-SWPPP does not include the Engineering Report (project design calculations). This document does not require submission or approval by the SCDHEC, regulated MS4 entity, or an approved entity with Permitting Authority prior to obtaining coverage under this permit.

C. Best Management Practices (BMPs) - Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to Surface Waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control Site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. In order to effectively reduce erosion and sedimentation impacts, Best Management Practices (BMPs) must be designed, installed, and maintained during land disturbing activities.

1.4 OS-SWPPP

A. The project specific OS-SWPPP is hereby incorporated as part of this specification and attached to this specification.

1.5 SUBMITTALS

A. Product Data

1. Certifications: All supplied BMPs.

B. Quality Assurance / Quality Control Submittals

1. Design Data
2. Test Reports
3. Certificates
4. Manufacturer's Instructions / Field Reports
5. Qualification Statements

C. Closeout Submittals

1. Stormwater As-Builts

1.6 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
2. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.

B. Regulatory Requirements

1. Comply with federal, state, and local regulations.
2. Comply with the requirements of the stormwater / land disturbance permit and approved plans issued by South Carolina Department of Health and Environmental Control (SCDHEC) – Bureau of Water (BOW) and the MS4 (York County).

C. Certifications

1. Provide product certifications for all manufactured BMPs.

D. Pre-Construction Meetings

1. Prior to performing construction activities at the site, all contractors who will engage in land disturbing activities must attend and document attendance at a pre-construction meeting.
2. The contractor shall invite the Owner, Engineer, and agencies as indicated in the OS-SWPPP to the pre-construction meeting, a minimum of 7 days prior to conducting the meeting.

1.7 DELIVERY, STORAGE, AND HANDLING

A. During all periods of shipment and storage, the filter fabric shall be protected from direct sunlight, ultra-violet rays, temperatures greater than 140 degrees F., mud, dirt, dust, and debris. The fabric shall be maintained, wrapped in a heavy-duty protective covering.

B. Delivery

1. Seed: Protect from drying out and from contamination during delivery, on-site storage, and handling.
2. Fertilizer Delivery: Deliver to site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer may be furnished in bulk with certificate indicating the above information.

C. Storage: Store Seed, Fertilizer & Mulch in cool, dry locations away from contaminants.

D. Handling: Do not drop or dump materials from vehicles.

1.8 MAINTENANCE

A. Maintain BMPs in accordance with OS-SWPPP and drawings.

PART 2 - PRODUCTS

2.1 SUMMARY

A. All products shall be provided and installed in accordance with the OS-SWPPP. All materials, construction methods, testing, and approvals shall be in accordance with this document.

2.2 MATERIALS

A. All erosion control products, sediment control devices and materials for non-stormwater BMPs as specified herein and on the Construction Drawings.

PART 3 - EXECUTION

3.1 SUMMARY

A. All work shall be performed in accordance with the OS-SWPPP. All materials, construction methods, testing, and approvals shall be in accordance with this document.

3.2 PREPARATION

A. Communicate SWPPP requirements, emphasizing construction sequence requirements, to Site Contractor, Erosion and Sediment Control Best Management Practice (BMP) installers, and all subcontractors working on-site.

B. Install initial BMPs according to the sequence of construction in the SWPPP. Disturb only those areas absolutely necessary to install the initial BMPs. No other earth disturbance is permitted until after the Stormwater Pre-construction meeting.

C. Inspect and certify the initial BMP installation with Engineer.

3.3 EROSION AND SEDIMENTATION CONTROL IMPLEMENTATION

A. Place erosion and sediment control systems in accordance with the drawings and SWPPP or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.

B. The SWPPP and Construction Drawings shall be corrected, modified or updated as site conditions change. Contractor must obtain approval from the Engineer prior to any modification or substitution of specified Best Management Practices. All BMP changes (and references to approvals) shall be noted in the SWPPP and posted on the drawings. Construction Drawings should be updated daily to track progress when any of the following activities

occur: BMP installation or modification, major construction (paving, storm sewer installation, footing installation, etc…), clearing, grubbing or grading, or temporary or permanent stabilization.

C. Owner has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures.

D. Maintain erosion and sedimentation control systems as dictated by site conditions, indicated in the construction documents, or as directed by governing authorities or Owner to control sediment until final stabilization. Contractor shall respond to maintenance or additional work ordered by Owner or governing authorities immediately and in compliance with requirements of the applicable permit, and in no case may the initiation of a response exceed 24 hours. If governing authority requests changes to site BMPs or the SWPPP, ensure that changes are properly documented on the SWPPP Construction Drawings and notify the Engineer as to the request to determine if official SWPPP amendments are required.

E. If, during the course of construction at a Site, the temporary removal or alteration of a BMP is necessary to accomplish the construction or to protect health and safety, the Project Superintendent shall note such removal or alteration on the Weekly Inspection Report Form, including specific information regarding the changes made and the day and time such changes were made. During the period the specified BMP is removed due to construction, the contractor must implement appropriate alternate BMPs at the end of each work day to serve a similar function to those BMPs temporarily removed. Contractor shall restore the original specified BMP as soon as practicable but in no case later than 24 hours after the completion of the activity that required the change. Contractor shall take all reasonable measures to prevent discharges from the Site to the waters of the United States during the time that the BMP has been altered or removed, including, but not necessarily limited to timing the removal or alteration of the BMP so that it occurs when precipitation is not forecasted and installing new or alternate BMPs outside the affected area.

F. Contractor shall incorporate permanent erosion control features, paving, and vegetation establishment into project at earliest practicable time within approved sequence of construction to minimize need for temporary controls.

3.4 INSPECTIONS

A. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.

B. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours notice for all required observations or tests.

C. Inspections shall be in accordance with the OS-SWPPP and drawings.

END OF SECTION 312523

Improvement to Ebenezer Park Phase II

Rock Hill, SC
York County

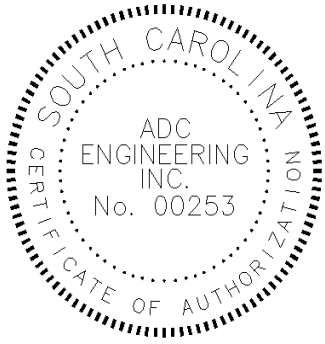
Comprehensive SWPPP

March 09, 2023

25 WOODS LAKE ROAD
SUITE 210
GREENVILLE, SC 29607
864-751-9121
WWW.ADCENGINEERING.COM

ENGINEERING

Project Manager: Larry Barthelemy, P.E.
larryb@adcengineering.com
ADC Project No. 21435



Comprehensive Stormwater Pollution Prevention Plan (C-SWPPP) For Construction Activities:

Project/Site Name:

Improvements to Ebenezer Park – Phase II
Project Address/Location:
4490 Boatshore Road
Rock Hill, SC 29732
York County

Primary Permittee:

York County
Permittee/Owner Contact:
6 South Congress Street
York, SC 29745
(803) 818-5733
Lisa Hagood
Lisa.hagood@yorkcountygov.com

SWPPP Preparer:

ADC Engineering, Inc.
Larry Barthelemy, P.E.
25 Woods Lake Road, Suite 210
Greenville, South Carolina 29607
Ph: (864) 751-9121 / Fax: (843) 566-0162
larryb@adcengineering.com

Day-to-Day Operator:

TBD

(Leave Blank if not known.)

C-SWPPP Preparation Date:

March 9, 2023

Table of Contents

C-SWPPP is acronym for Comprehensive Storm Water Pollution Prevention Plan
****OS-SWPPP is acronym for On-Site Storm Water Pollution Prevention Plan***

CERTIFICATION STATEMENT:

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of *Title 48, Chapter 14 of the Code of Laws of SC, 1976* as amended, pursuant to *Regulation 72-300* et seq. (if applicable), and in accordance with the terms and conditions of *SCR100000*.

03/09/2023
(Signature and Seal)

Name: Larry Barthelemy, P.E.

Title: Partner

Date: 03/09/2023

SECTION 1 – PROJECT OVERVIEW

1.1. Narrative

A. Construction Activities and BMP Summary

This construction includes grading the existing site to accommodate the construction of the site improvements for the park.

Perimeter Control BMPs will be installed prior to the initiation of the mass clearing/grubbing and grading of the site.

The construction activities at this site will be implemented in 2 distinct Erosion Prevention and Sediment Control Phases. The first phase includes the initial installation of perimeter controls, sediment control BMPs and the construction entrances. The second phase includes the bulk of the construction activities, the implementation of internal stormwater management BMPs and final stabilization of the site.

B. Pre-Existing Conditions

The project area is made up of a single basin that drains from south to north towards Lake Wylie. The existing site is comprised of pavement, buildings, grass areas, woods, trails and concrete sidewalks.

C. Post-Development Conditions

Post-developed drainage patterns will mimic pre-development conditions and drain from south to north to Lake Wylie. The proposed site is comprised of pavement, buildings, grass areas, woods, trails and concrete sidewalks. A new underground drainage system will be constructed near the lake restroom building to collect runoff and convey it to the existing underground drainage system.

D. Stormwater Analysis

Below is a summary of the stormwater conditions for the project site.

Stormwater Summary		
Storm Data	**Pre-Development Conditions**	**Post-Development Conditions**
Impervious Area	9.2 acres	9.4 acres
Pervious Area	17.0 acres	16.8 acres
Total Area	26.2 acres	26.2 acres
Built Upon Area (BUA)	35%	36%

Water Quantity and Quality Control

Due to the nature of this project, no new stormwater management is proposed for this project. The project mostly includes replacing existing impervious area for new impervious area, resulting in no significant increase in stormwater runoff or contaminates. There are four existing bio-retention areas that were installed in phase 1 that treat the stormwater runoff from the existing parking area. Additionally, the existing grass and wooded areas will filter any contaminates out of the runoff.

E. Flooding Issues

From scaling the FEMA Flood Insurance Rate Map Panel 193, Community Number 4509C0193, Suffix E, dated September 26, 2008, a portion of the property along Lake Wylie is within flood zone AE with a

flood elevation of 570. The rest of the site is in zone X, which is outside the 100-year flood zone. No buildings or construction activity will be within the AE flood zone.

F. Residential Subdivision Information (As Applicable)

Not Applicable

1.2. Stormwater Management and Sediment Control

A. Erosion Prevention BMPs

As the existing site is cleared, grubbed and graded to the proposed contours shown on the construction site plans, erosion prevention BMPs shall be placed throughout the construction site to aid in the prevention of sediment-laden stormwater runoff. These BMPs shall be focused in areas with high potential of erosion, areas preceding infiltration practices, and shall be applied to all steep slopes. That is slopes equal to or greater than 3H:1V.

Each erosion prevention measure shall be selected on a site-specific basis and details have been provided on the construction site plans. The plans identify all proposed Erosion Prevention BMPs and the recommended installation, maintenance, and inspection procedures.

Examples of Erosion Prevention BMPs are, but are not limited to, surface roughening, temporary seeding, erosion control blankets, turf reinforcement mats, sodding, riprap, outlet protection, dust control, and polyacrylamide (PAM). Information on the design and proper use of Erosion Prevention BMPs can be located in the SC DHEC's BMP Handbook.

The purpose of soil stabilization is to prevent soil from eroding and leaving the site. In the natural condition, soil is stabilized by native vegetation. The primary technique to be used at this project for stabilizing site soils will be to provide a protective cover of grass, pavement, or building structure.

Temporary Seeding or Stabilization – All denuded areas that will be inactive for 14 days or more, must be stabilized temporarily with the use of fast-germinating annual grass/grain varieties appropriate for site soil and climate conditions, straw/hay mulch, wood cellulose fibers, tackifiers, netting and/or blankets. Stockpiles and diversion ditches/berms must be stabilized to prevent erosion and dust issues. Stormwater conveyance BMPs (diversion ditches, dikes, channels, etc.) shall be stabilized within 7 days of construction.

Permanent Seeding, Sod or Mulching – All areas at final grade must be seeded, mulched or covered with sod within 14 days after completion of work in that area. Seed immediately after final grade is achieved and soils are prepared to take advantage of soil moisture and seed germination. At the completion of ground-disturbing activities the entire site must have permanent vegetative cover, meeting vegetative density requirements, or mulch per landscape plan, in all areas not covered by hardscape (pavement, buildings, etc.).

Energy Dissipaters – Energy Dissipaters reduce runoff velocities from concentrated conveyance systems (pipes and swales), enhance the potential for infiltration and protect the soil from the erosive force of concentrated flows. Energy dissipaters include riprap aprons, level spreaders and soil reinforcement (such as erosion control blankets and turf reinforcement mats).

B. Sediment Control BMPs

Sediment Control BMPs are designed to remove some of the sediment accumulated within stormwater runoff, to the best extent practicable. These BMPs help prevent sediment impacts to adjacent properties and water bodies from stormwater discharges originating from construction sites.

Typically these BMPs are placed near each of the site's outfalls and are installed prior to clearing and

grubbing of the site (before large areas of soil are exposed). However, these BMPs can also be located throughout the construction site and, in these circumstances, are installed after mass grading has occurred. Placement, sizing and modifications of Sediment Control BMPs should be left to the SWPPP preparer and/or the Site Engineer. Contractors must consult the SWPPP Preparer as listed at the front of this SWPPP before making any significant changes to these BMPs.

Each sediment control BMP shall be selected on a site-specific basis. Examples of Sediment Control BMPs are, but are not limited to sediment traps, sediment basins, silt fence, rock check dams, rock sediment dikes, sediment tubes, and inlet protection. Please consult SC DHEC's BMP Handbook for more information on Sediment Control BMPs.

Silt Fence – Silt fence is a synthetic permeable woven or non-woven geotextile fabric incorporating metal support stakes at intervals sufficient to support the fence (5-feet maximum distance between posts), water, and sediment retained by the fence. The fence is designed to retain sediment-laden stormwater and allow settlement of suspended soils before the stormwater flows through the fabric and discharges from the site. Silt fence shall be located on the contour to capture overland, low-velocity sheet flows and is typically installed with a wire fence backing for additional support.

Install silt fence at a fairly level grade along the contour with the ends curved uphill to provide sufficient upstream storage volume for the anticipated runoff. Drainage areas shall not exceed ½ acre per 100 feet of wire-reinforced silt fence for slopes less than 2 percent.

Check Dams – Defined channels subject to concentrated flows in larger quantities and higher velocities may be protected with rock or other manufactured device (Geo-ridge for example) that can be used as a check dam. The dams impound sediment-laden water and allow for settlement of suspended soil before the stormwater flows over and through the device. Dams shall be placed along the water course at linear intervals in which the elevation of the bottom of the upper most check dam is at the same elevation as the top of the check dam immediately below it. This will allow the most ponding capacity and will not increase the velocity of the water flowing along the channel. Check dams are composed of crushed stone or rip rap or of other manufactured devices.

Storm Sewer Inlet Protection – Drainage inlets are protected from the intrusion of sediment through a variety of measures as shown on the details included in the Construction drawings. The primary mechanism is to place controls in the path of flow sufficient to slow the sediment-laden water to allow settlement of suspended soils before discharging into the storm sewer. It is possible that as construction progresses from storm sewer installation through to paving that the inlet protection devices will change.

C. Structural Control BMPs and Floodplain Placement

This site-specific SWPPP utilizes the following structural control BMPs: permanent vegetated swales, and storm sewer systems. These practices have been designed to either divert flows from exposed soils, to retain/detain flows, and to otherwise limit the runoff and the discharge of pollutants from disturbed areas of the construction site.

Throughout the lifespan of the construction project these BMPs will be installed and maintained, as required by the SWPPP and the construction site plans, until final stabilization has been achieved for the areas draining to each BMP. Upon final stabilization, each structural control BMP must be modified to the post-construction conditions shown within the approved construction site plans or removed, if the structural BMP was a temporary structure.

D. Construction Entrances and Dust Control

All access areas into and out of the limits of disturbance, as shown on the construction site plans, are required to be equipped with a construction entrance. The use of this BMP will limit the amount of sediment being transported by construction vehicles onto existing roadways or other impervious areas. Any tracked sediment, along with any attached pollutants, deposited on impervious areas could be washed downstream during the next rain event. Each construction entrance must be installed as shown in the details section of the construction site plans.

If a new entrance or exit is required, that is not shown on the plans, install the construction entrance as noted by the construction entrance detail, mark the location on the plans and make a record of this minor modification in the SWPPP's modification log, which is located within one of the appendices of the On-site SWPPP.

Each stabilized construction entrance should be used in conjunction with Street Sweeping measures if it becomes apparent that sediment is still being tracked onto adjacent impervious areas, even with the use of the construction entrance.

During extremely dry conditions, drought, and/or excessive winds, the construction site should be treated for dust control to prevent the suspension of fine sediment particles into the air, being carried offsite, and deposited on adjacent properties or surface waters. This practice may not be directly called out for on the construction site plans. A water tanker used to spray the soil down may be an effective way to prevent excessive dust at a construction site.

E. Water Quality BMPs During Construction

Site-specific water quality BMPs (e.g., sediment basins, sediment traps, rock check dams, and rock sediment dikes) must be installed prior to the mass clearing, grubbing and grading of the site, and must be kept in functioning order throughout the lifespan of all construction activities. Each of these BMPs must be maintained and inspected until all areas draining to these BMPs have reached final stabilization, approved by the construction site inspector or the SWPPP Preparer, and recorded within the stabilization log located as an appendix of the On-site SWPPP.

The location, installation procedures, and maintenance procedures for each water quality BMP can be found within the approved construction site plans.

Storm Sewer Inlet Protection – Curb and grated inlets are protected from the intrusion of sediment through a variety of measures as shown on the details included in the Construction drawings. The primary mechanism is to place controls in the path of flow sufficient to slow the sediment-laden water to allow settlement of suspended soils before discharging into the storm sewer. It is possible that as construction progresses from storm sewer installation through to paving that the inlet protection devices will change.

Check Dams – Defined channels subject to concentrated flows in larger quantities and higher velocities may be protected with rock or other manufactured device (Geo-ridge for example) that can be used as a check dam. The dams impound sediment-laden water and allow for settlement of suspended soil before the stormwater flows over and through the device. Dams shall be placed along the water course at linear intervals in which the elevation of the bottom of the upper most check dam is at the same elevation as the top of the check dam immediately below it. This will allow the most ponding capacity and will not increase the velocity of the water flowing along the channel. Check dams are composed of crushed stone or rip rap or of other manufactured devices.

Diversion Ditch/Berm – Diversion ditches (swales) and berms (dikes) are constructed as shown on the Drawings at locations within the construction site to intercept overland flow and direct or divert flow to a sediment basin or other point where discharge can be controlled. Ditches are excavated in the surface

soils with the spoils from the excavation typically placed along the downstream edge of the ditch to provide additional capacity. Berms are built up on the surface soils and compacted to create a stable diversion.

F. Post-Construction Water Quality

Grass Lined Ditches and Swales – Grass lined swales capture, treat and release storm water from a particular drainage area. Grass lined swales filter out contaminates to improve water quality. Grass swales provide very little stormwater storage and must be used in conjunction with other BMPs to meet water quantity requirements.

Energy Dissipaters – Energy Dissipaters reduce runoff velocities from concentrated conveyance systems (pipes and swales), enhance the potential for infiltration and protect the soil from the erosive force of concentrated flows. Energy dissipaters include riprap aprons, level spreaders and soil reinforcement (such as erosion control blankets and turf reinforcement mats).

Vegetated Filter Strips - Vegetated filter strips are zones of vegetation where pollutant-laden runoff is introduced as sheet flow. Vegetated filter strips may take the form of grass filters, grass filter strips, buffer strips, vegetated buffer zones, riparian vegetated buffer strips, and constructed filter strips. Vegetated filter strips are used to remove pollutants from overland sheet flow but are not effective in removing sediment from concentrated flows. Vegetated filter strip effectiveness fluctuates considerably depending on vegetation type, vegetation height and density, season of the year, eroded particle characteristics, size of drainage area, and site topography.

G. Other Stormwater Management Procedures

Stockpile Management - Stockpiles of soil shall be protected during construction. Silt fence shall be installed around the downstream side of the stockpile to prevent sedimentation. Additionally, stockpiles of soil shall be temporarily stabilized to control erosion. Stockpiles of construction debris, including soil, shall have all runoff directed to a sediment basin or trap.

Non-Stormwater Discharges / Dewatering – Non-stormwater components of site discharges must be clean water. Water used for construction which discharges from the site must originate from a public water supply or private well approved by the State Health Department. Water used for construction that does not originate from an approved public supply must not discharge from the site. It can be retained in the ponds until it infiltrates and evaporates. Other non-stormwater discharges would include ground water. Only uncontaminated ground water can be discharged from the site, as allowed by and in accordance with applicable local ground water dewatering permits/regulations. When non-stormwater is discharged from the site, it must be done in a manner such that it does not cause erosion of the soil during discharge.

Process water such as power washing and concrete cutting must be collected for treatment and disposal. It is not to be flushed into the site storm drain system. A groundwater dewatering permit is not required.

Verify discharges from dewatering activities are allowed non-stormwater discharges under the General Permit. Allowable non-stormwater discharges include:

1. Discharges from fire-fighting activities;
2. Fire hydrant flushings;
3. Waters used to wash vehicles where detergents are not used;
4. Water used to control dust in accordance with Section 3.2.2 (Stormwater Management

and Sediment Control);

5. Potable water including uncontaminated water line flushings;
6. Routine external building wash down that does not use detergents;
7. Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;
8. Uncontaminated air conditioning or compressor condensate;
9. Uncontaminated ground water or spring water;
10. Foundation or footing drains where flows are not contaminated with process materials such as solvents;
11. Uncontaminated excavation dewatering;
12. Landscape irrigation; and
13. Dechlorinated swimming pool discharges.

Obtain a dewatering permit according to state and local regulations, if discharges from dewatering activities are not allowed under the General Permit. Discharges from dewatering operations must be directed through an appropriate pollution prevention/treatment measure, such as a pump discharge filter bag, sediment trap or sediment basin prior to being discharged from the site or into a water body of the State. Under no circumstances are discharges from dewatering operations to be discharged directly into streams, rivers, lakes or other areas beyond the permitted project area. Likewise, discharges into storm sewer systems that do not drain to a suitable on-site treatment facility, such as a basin, are also prohibited. Discharges from dewatering operations must also be conducted in a manner sufficient to prevent erosion from the discharge runoff.

Use best management practices when dewatering. Place intake hose on a flotation or similar device and do not pump directly from the bottom of the basin, trench, etc. Always pump through a sediment control BMP and dewater within the permitted limits of disturbance to ensure discharge criteria are achieved. Do not discharge on a slope greater than three percent or within 20' of a surface water body. Dewatering should not occur during or immediately after precipitation events, but exceptions will be evaluated on case by case basis.

Solid Waste Disposal - No solid materials, including building materials, are allowed to be discharged from the site with stormwater. All solid waste, including disposable materials incidental to the major construction activities, must be collected and placed in containers. The containers will be emptied when 95% full, or as necessary, by a certified trash disposal service and hauled away from the site. Covers for the containers will be provided as necessary to meet state and local requirements. Construct covers as practicable, or required, to prevent stormwater contact and pollutant discharges from solid waste receptacles. The location of solid waste receptacles shall be shown on the Drawings.

Substances that have the potential for polluting surface and/or groundwater must be controlled by whatever means necessary in order to ensure that they do not discharge from the site. As an example, special care must be exercised during equipment fueling and servicing operations. If a spill occurs, it must be contained and disposed of so that it will not flow from the site or enter groundwater, even if this requires removal, treatment, and disposal of soil. In this regard, potentially polluting substances should be handled in a manner consistent with the impact they represent.

Sanitary Facilities - All personnel involved with construction activities must comply with state and local

sanitary system regulations. Temporary sanitary facilities will be provided at the site throughout the construction phase. They must be utilized by all construction personnel and will be serviced by a commercial operator. The location of sanitary facilities shall be shown on the Drawings. Portable toilets must be securely anchored and are not allowed within 30' of inlets or permitted limit of disturbance or within 50' of a water of the State.

Concrete Waste from Concrete Ready-Mix Trucks - Discharge of excess or waste concrete and/or wash water from concrete trucks will be allowed on the construction site, but only in approved aboveground portable concrete washout containers (preferred) or in specifically designated lined and diked areas prepared to prevent contact between the concrete and/or wash water and stormwater that will be discharged from the site. The General Contractor shall eliminate or minimize the number of seams in the liner.

Alternatively, waste concrete can be placed into forms to make rip rap or other useful concrete products. The cured residue from the concrete washout diked areas shall be disposed in accordance with applicable state and federal regulations. This jobsite superintendent is responsible for assuring that these procedures are followed. The location of concrete washout areas shall be shown on the Drawings. Follow all applicable environmental regulations for concrete wash out pits.

SCDHEC requires all concrete waste areas to be a minimum of 50 feet away from any inlet or other conveyance system.

Masons' Area - Contractor shall identify masons' area on the site and indicate location on the Drawing. To the extent practical, all masonry tools, material, including sand and sacked cement or mortar materials, and equipment shall be located within the area identified. Runoff control, such as berms or diversion ditches, silt fence, straw wattles, or other means of containment shall be provided to prevent the migration of stormwater pollutants in runoff from the masons' area. Receptacles for debris and trash disposal shall also be provided.

Fuel Tanks - Temporary on-site fuel tanks for construction vehicles shall meet all state and federal regulations. Tanks shall have approved spill containment with the capacity required by the applicable regulations. From NFPA 30: All tanks shall be provided with secondary containment (i.e. containment external to and separate from primary containment). Secondary containment shall be constructed of materials of sufficient thickness, density, and composition so as not to be structurally weakened as a result of contact with the fuel stored and capable of containing discharged fuel for a period of time equal to or longer than the maximum anticipated time sufficient to allow recovery of discharged fuel. It shall be capable of containing 110% of the volume of the primary tank if a single tank is used, or in the case of multiple tanks, 150% of the largest tank or 10% of the aggregate, whichever is larger.

The tanks shall be in sound condition free of rust or other damage which might compromise containment. Fuel storage areas will meet all EPA, OSHA and other regulatory requirements for signage, fire extinguisher, etc. Hoses, valves, fittings, caps, filler nozzles, and associated hardware shall be maintained in proper working condition at all times. The location of fuel tanks shall be shown on the Drawings and shall be located to minimize exposure to weather and surface water drainage features.

A Spill Prevention, Control and Countermeasure (SPCC) Plan must be developed if aboveground oil storage capacity at the construction site exceeds 1,320-gallons or as specified by SCDHEC. Containers with a storage capacity of 55-gallons or less are not included when calculating site storage capacity. The General Contractor shall work with the CEC to develop and implement a SPCC Plan in accordance with the Oil Pollution Prevention regulation at Title 40 of the Code of Federal Regulations, Part 112, (40 CFR 112).

Hazardous Material Management and Spill Reporting Plan - Any hazardous or potentially hazardous material that is brought onto the construction site will be handled properly in order to reduce the potential for stormwater pollution. All materials used on this construction site will be properly stored, handled, dispensed and disposed of following all applicable label directions. Flammable and combustible liquids will be stored and handled according to 29 CFR 1926.152. Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids.

Material Safety Data Sheets (MSDS) information will be kept on site for any and all applicable materials.

In the event of an accidental spill, immediate action will be undertaken by the General Contractor to contain and remove the spilled material. All hazardous materials, including contaminated soil and liquid concrete waste, will be disposed of by the Contractor in the manner specified by federal, state and local regulations and by the manufacturer of such products. As soon as possible, the spill will be reported to the appropriate agencies. As required under the provisions of the Clean Water Act, any spill or discharge entering waters of the United States will be properly reported. The General Contractor will prepare a written record of any spill and associated clean-up activities of petroleum products or hazardous materials in excess of 1 gallon or reportable quantities, whichever is less. The General Contractor will provide notice to Owner, via the SWCT Hotline, immediately upon identification of a reportable spill. A spill report form is located in Appendix H.

Any spills of petroleum products or hazardous materials in excess of Reportable Quantities as defined by EPA or the state or local agency regulations, shall be immediately reported to the EPA National Response Center (1-800-424-8802) and SCDHEC (1-888-481-0125).

- The State reportable quantity for petroleum products is 25 gallons.

The reportable quantity for hazardous materials can be found in 40 CFR 302 and South Carolina Code of Regulations 61-79 (www.scstatehouse.gov/coderegs/C061d.htm).

In order to minimize the potential for a spill of petroleum product or hazardous materials to come in contact with stormwater, the following steps will be implemented:

a) All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, additives for soil stabilization, concrete, curing compounds and additives, etc.) will be stored in a secure location, under cover and in appropriate, tightly sealed containers when not in use.

b) The minimum practical quantity of all such materials will be kept on the job site and scheduled for delivery as close to time of use as practical.

c) A spill control and containment kit (containing for example, absorbent material such as kitty litter or sawdust, acid neutralizing agent, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided on the construction site and location(s) shown on Drawings.

d) All of the product in a container will be used before the container is disposed of. All such containers will be triple rinsed, with water prior to disposal. The rinse water used in these containers will be disposed of in a manner in compliance with state and federal regulations and will not be allowed to mix with stormwater discharges.

e) All products will be stored in and used from the original container with the original product label.

f) All products will be used in strict compliance with instructions on the product label.

g) The disposal of excess or used products will be in strict compliance with instructions on the products label.

1.3. Sequence of Construction

The construction sequence for this project has been provided on the construction site plans. Each item/step of that construction sequence has been listed is the sequence that they should be implemented. For additional information or questions on the sequencing please contact the SWPPP Preparer or the Permittee referenced on the cover of this SWPPP.

1.4. Non-Numeric Effluent Limits

A. Stormwater Volume and Velocity Control

During the implementation of construction activities, all parties performing work at this construction site whose work may affect the implementation of the SWPPP must be informed of and directed on how to comply with this Non-Numeric Effluent Limit, which requires the management of stormwater runoff within the construction site and at each outfall. The purpose of this requirement is to control the stormwater volume and velocity at these locations to minimize erosion.

Specifically, each responsible party should be made aware of the practices that have been or should be implemented at the construction site to accomplish these particular stormwater management practices. Below is a list of practices that may be utilized within the disturbed area and at each outfall at construction sites to control stormwater volume and velocity:

Volume Control

- Limiting the amount of disturbed area and exposed soils
- Staging and/or Phasing of the Construction Sequence;
- Sediment Basins and Sediment Traps
- Diverting off-site flow around the construction site;
- Controlling the Drainage Patterns within the Construction Site;
- Temporary Stabilization of Disturbed Areas.

Velocity Control

- Surface Roughening and/or other Slope Stabilization Practices;
- Level Spreaders, Riprap Plunge Pools and/or other Velocity Dissipation BMPS located at the Construction Site's and Sediment Basin Outfalls.
- Use of Rock Checks, Sediment Tubes, Etc. in Temporary Diversions Swales and Ditches.
- Use of Erosion Control Blankets, Turf Reinforcement Mats, and other Non-Vegetative BMPs that can be used to Quickly Stabilize Disturbed Areas.

The SWPPP Preparer/Engineer should approve any modifications (Additional BMPs or Changes to Existing BMPs) to address the management of stormwater volume and velocity prior to implementation. All approved SWPPPs that were issued coverage under the CGP should include ample BMPs and other control measures to address this specific Non-Numeric Effluent Limit.

B. Soil Exposure, Compaction and Preservation

Throughout construction activities, the amount of soil exposed during construction should be kept to a minimum. This may be accomplished by minimizing the amount the disturbed area within the permitted Limits of Disturbance (shown on the approved construction site plans) to only that which is necessary to complete the proposed work. For areas that have already been disturbed and where construction activities will not begin for a period of 14 days or more, temporary stabilization techniques must be implemented.

Prior to implementation of any major grading activities, topsoil is to be preserved by placing it in areas designated for stockpiling until final grades are reached. Each stockpile must be equipped with proper sediment and erosion controls to preserve the topsoil and protect adjacent areas from impacts. Once final grades have been reached, the preserved topsoil should be utilized to apply to areas identified for stabilization. Topsoil contains nutrients and organisms that aid in the growth of vegetation.

The Compaction of Soil should also be minimized to the degree practicable during grading activities. This is especially important during the replacement of topsoil to aid in a quick establishment of vegetative cover. Compaction of soil may also reduce rainfall's ability to infiltrate into the soil, increasing the amount of stormwater runoff.

C. Soil Stabilization

Throughout construction activities, soil stabilization techniques are to be initiated as soon as practicable whenever any clearing, grading, excavating, or other land-disturbing activities have permanently or temporarily ceased on any portion of the construction site and will not resume for a period exceeding 14 calendar days. For areas where initiating stabilization measures is infeasible, (e.g., where snow cover, frozen ground, or drought conditions preclude stabilization), initiate vegetative or non-vegetative stabilization measures as soon as practicable.

D. Steep Slopes (Slopes of 30% grade or greater)

All disturbed steep slopes (30% grade, ~3H:1V, or greater), and steep slopes to be created through grading activities must be managed in a fashion that limits the potential of erosion along the slopes. All parties whose work is/was responsible for the creation/disturbance of steep slopes must comply with the following items:

- Minimize the Disturbance of all steep slopes, when possible.
- Divert Concentrated or Channelized Flows of stormwater away from and around steep slope disturbances.
- Use Specialized BMP Controls including temporary and permanent seeding with soil binders, erosion control blankets, surface roughening, reducing continuous slope length with terracing or diversions, gradient terraces, interceptor dikes and swales, grass-lined channels, pipe slope drains, subsurface drains, level spreaders, check dams, seep berms, and triangular silt dikes to minimize erosion.
- Initiate Stabilization Measures as soon as practicable on any disturbed steep slope areas where construction activities have permanently or temporarily ceased and will not resume for a period exceeding 7 calendar days.
- A Vegetative and/or Non-Vegetative Cover must be established within 3 working days from the time that stabilization measures were initiated.

Stabilization of steep slopes should be a priority for those performing work at the construction site. At the very least, runoff control BMPs should be implemented to transport stormwater runoff from the top

of the slope to the toe of the slope. An example of this is to install diversion swales along the top of slope and direct the runoff towards pipe slopes drains to transports the runoff to the toe of the slope. All pipe slope drain outlets are to be equipped proper outlet protection.

E. Sediment Discharge Minimization

Permittees, Contractors, and all other parties responsible for conducting land-disturbing activities are required to install and maintain all erosion and sediment BMPs that are identified on the approved construction site plans. These BMPs have been designed and approved to address such factors as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soils particle sizes expected to be present on the construction site. Proper installation, inspection, and maintenance will allow these BMPs to operate at maximum efficiencies in order to minimize sediment discharges to the maximum extent practical.

F. Pollutant Discharge Minimization

Permittees, Contractors, and all other parties responsible for conducting land-disturbing activities are required to install, implement, and maintain effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, the following items must be implemented:

- Minimize the discharge of pollutants from dewatering trenches and excavations by managing runoff with the appropriate controls. Otherwise these discharges are prohibited;
- Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
- Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to stormwater; and
- Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.

G. Prohibited Discharges

Permittees, Contractors, and all other responsible parties for conducting land-disturbing activities are prohibited to discharges, from the construction site, the following items:

- Wastewater from washout of concrete, unless managed by an appropriate control;
- Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and
- Soaps or solvents used in vehicle and equipment washing.

1.5. Buffer Zone Management

Not Applicable.

SECTION 2 – SITE FEATURES AND SENSITIVE AREAS

2.1. Sources of Pollution

Throughout construction activities, each permittee, contractor, and person responsible for conducting work will need to ensure that sources of pollution are managed to prevent their discharge from the construction site. Expected pollution sources during construction have been identified in **Table 2.1-A**, but due to the nature of construction activities, it is often tough to predict all pollution sources that may appear throughout the life of a construction project. For that reason, the following table has also been provided to help all those performing work at this construction site identify possible sources of pollution

Stormwater runoff subjected to the identified pollution sources must be treated by the appropriate BMPs as directed by this SWPPP.

In the event that any additional sources of pollution are identified during construction, the person(s) with day-to-day operational control at the site is to add the new source(s) to **Table 2.1-A** and consult with the SWPPP Preparer to properly address this source and to prevent the discharge of its pollutant through stormwater runoff.

Table 2.1-A: Potential Sources of Pollution

Source	Material or Chemical	Location*	Appropriate Control Measures
Loose soil exposed/disturbed during clearing, grubbing and grading activities	Sediment	All areas within the Limits of Disturbance	As directed by the construction Plans. This includes Silt Fence, sediment tubes, sediment basins, and sediment traps.
Areas where construction equipment are cleaned, a.k.a. concrete washout	Heavy Metals & pH	Located adjacent to each construction entrance	Concrete Washout Basin as shown on the plans.
Water encountered during trenching	Nutrients & Sediment	In and around any trenching activities.	Direct water into impoundments such as basins or traps to allow for the sedimentation of the listed pollutants.
Paving Operations	Sediment & Trash	All areas to be paved.	Inlet protection.
Material Delivery and Storage Areas	Nutrients, pH, Sediment, Heavy Metals, oils & grease	All areas used as storage areas	Silt fence and/or sediment dikes
Equipment fueling and maintenance areas	Metals, hydrocarbons, oils and greases	Areas surrounding fuel tanks	Provide secondary containments, locate in upland areas. Repair leaking and broken hoses.
Paints	Metal oxides, stoddard solvent, talc, calcium-carbonate, arsenic	Throughout site, primarily in areas of building construction	Washwater should be contained and is prohibited from being discharged

***Area where material/chemical is used on site.**

2.2. Surface Waters

Stormwater runoff from the proposed construction site discharges to Lake Wylie. From the lake, the runoff is conveyed to the Catawba River.

2.3. Impairments and TMDLs

The site drains to water quality monitoring station CW-230 in Lake Wylie. This monitoring station is not on the South Carolina 303 d list for impairments. Additionally, a TMDL has not been established for this station.

A. Impairments Affected by Construction Site Discharges and Methods to Control Potential Pollutants Causing or Contributing to the Impairments

B. Impairments Affected by Construction Site Discharges and Methods to Control Potential Pollutants Causing or Contributing to the Impairments

1. **BIO (Macroinvertebrate Community):** A balanced and varied group of Macroinvertebrate organisms is an indicator of a healthy stream that supports aquatic life. A balanced community can be defined as a natural, diverse group of organisms (including Macroinvertebrate) characterized by the ability to sustain itself through season changes, presence of food chain species and a lack of domination by pollutant tolerant or invasive species. If these conditions do not exist, then the site may be considered impaired due to the presence of an undesirable or non-existent Macroinvertebrate community. Sediment from construction sites may further threaten the propagation of these organisms.

   Address by: Examples include limiting the amount of disturbed area, designing sediment control BMPs to remove the maximum amount of sediment possible, immediate stabilization of disturbed areas, and other practices may be utilized to control the discharge of sediment from construction sites.

2. **Turbidity:** Turbidity can be generally defined as the "cloudiness" of a waterbody and may be caused by the growth of aquatic phytoplankton and the presence of suspended solids in the water column. In SC, a water quality standard for turbidity is applicable to all waters of the State (see R. 61-68 D. 11. for numeric targets by waterbody classification). Turbidity levels that exceed the water quality standard may reduce light penetration, thereby inhibiting aquatic flora growth, and may reduce the ability of fauna, such as fish, to absorb oxygen across their gills.

   Address by: Examples include limiting the amount of disturbed area, designing sediment control BMPs to remove the maximum amount of sediment possible, immediate stabilization of disturbed areas, and other practices may be utilized to control the discharge of sediment from construction sites.

3. **TP (Total Phosphorus):** Similar to total nitrogen, TP is an essential nutrient for the propagation of aquatic life. In SC, a water quality standard for TP is applicable to lakes greater than 40 acres (see R. 61-68 D. 11. for numeric and narrative targets). At acceptable levels, TP is assimilated by aquatic flora ensures the propagation of an overall balanced, indigenous aquatic community. TP levels that exceed the water quality standard are considered impaired and may cause negative impacts to the overall health of the aquatic community by promoting excessive algal growth in lakes. Phosphorous may enter a site's stormwater when excess amounts of the nutrient are applied to the site during temporary or final stabilization.

   Address by: To prevent this soil should be tested to determine the quantity of the nutrient present in the soil and the correct amount that needs to be added so that it is absorbed by the vegetation.

4. **TN (Total Nitrogen):** Similar to total phosphorus, TN is an essential nutrient for the propagation of aquatic life. In SC, a water quality standard for TN is applicable to lakes greater than 40 acres (see R. 61-68 D. 11. for numeric and narrative targets). At acceptable levels, TN is assimilated by

aquatic flora and ensures the propagation of an overall balanced, indigenous aquatic community. TN levels that exceed the water quality standard are considered impaired and may cause negative impacts to the overall health of the aquatic community by promoting excessive algal growth in lakes. Nitrogen may enter a site's stormwater when excess amounts of the nutrient are applied to the site during temporary or final stabilization

Address by: Examples include that the soil should be tested to determine the quantity of the nutrient present in the soil and the correct amount that needs to be added so that it is absorbed by the vegetation.

5. **Chlorophyll-a (CHLA):** CHLA is a pigment present in the cells of photosynthetic flora and some algal species. The presence of CHLA in an aquatic environment is a water quality indicator of the overall productivity in the aquatic system. CHLA is linked to the levels of TP, TN and light penetration in the water column. In SC, a water quality standard for CHLA is applicable to lakes greater than 40 acres (see R. 61-68 D. 11. for numeric and narrative targets). CHLA levels that exceed the water quality standard may suggest that other undesirable water quality impacts are present as the aquatic system may be too productive to support the propagation of an overall balanced, indigenous aquatic community. Excess nutrients may discharge from a construction site during temporary and final stabilization. Limiting the amount of phosphorus and nitrogen applied while establishing vegetation will prevent excessive levels of CHLA in receiving waters.

   Address by: Examples include that the soil should be tested to determine the quantity of the nutrients present in the soil and the correct amount that needs to be added so that it is absorbed by the vegetation.

6. **Fecal Coliform (FC) in Shellfish Harvesting waters:** Fecal Coliform is an indicator bacteria for other pathogens which may be present in a waterbody. Shellfish Harvesting Waters are tidal salt waters protected for shellfish harvesting and must be protected to a higher standard than other waters because of the risk to human health posed by ingesting shellfish from areas with high levels of bacteria. Bacteria levels increase following rain events. Potential sources of bacteria on construction sites include improperly located porta-johns and litter that may attract rodents and other animals.

   Address by: Porta-johns should be placed away from WoS and not placed on catch basins and other drainage structures. Litter and construction debris should be placed in identified areas and emptied on a routine basis.

C. Impairment Sources and Prevention

Construction sites can contribute to these impairments directly through the release of excess soil and/or nutrients within stormwater runoff. For this reason, proper sediment and erosion control BMPs should be implemented and the design of the stormwater management systems, during both construction and post-construction, should address the control of stormwater runoff. A reduction in the volume released or the rate at which this volume is released can significantly improve the quality of stormwater runoff and limit the amount of the pollutants that contribute to the above listed impairments.

As an example, sediment basins and/or traps should be used during construction to allow for sedimentation of soils/nutrients, and to control the release of stormwater into the impaired water body. Vegetated Detention and Infiltration structures should be implemented as post-construction BMPs to control stormwater volumes. Caution is advised when using fertilizers to reach Final Stabilization; excess fertilizer can contribute to each of the above listed impairments.

D. Site-Specific Requirements

This construction site's discharges drain into WoS that is either Impaired or has an established TMDL for the following impairment(s): BIO (macroinvertebrate), turbidity, Total Phosphorus, Total Nitrogen, Chlorophyll-a, and Fecal Coliform. Due to the possibility of pollutants in construction stormwater discharges from this site that may contribute to any of these impairments, the following must be conducted throughout the lifespan of all land-disturbing activities at this site:

- Monthly monitoring of the construction site's outfalls;
- Biweekly inspections of all the primary sediment control BMPs;
- Employee training/acknowledgement during the Pre-Construction Meeting;
- Installation of additional BMPs to meet the water quality standards (as directed by the SWPPP preparer and as approved by the regulating agency); and
- All sediment control BMPs have been designed to meet or exceed an 80% trapping efficiency.

E. Impairment Sources and Prevention

Construction sites can contribute to these impairments directly through the release of excess soil and/or nutrients within stormwater runoff. For this reason, proper sediment and erosion control BMPs should be implemented and the design of the stormwater management systems, during both construction and post-construction, should address the control of stormwater runoff. A reduction in the volume released or the rate at which this volume is released can significantly improve the quality of stormwater runoff and limit the amount of the pollutants that contribute to the above listed impairments.

As an example, sediment basins and/or traps should be used during construction to allow for sedimentation of soils/nutrients, and to control the release of stormwater into the impaired water body. Vegetated Detention and Infiltration structures should be implemented as post-construction BMPs to control stormwater volumes. Caution is advised when using fertilizers to reach Final Stabilization; excess fertilizer can contribute to each of the above listed impairments.

F. Site-Specific Requirements

Not Applicable

2.4. Critical Areas (CZC only)

Not Applicable

SECTION 3 – COMPLIANCE REQUIREMENTS

3.1. SWPPP Availability

A copy of the OS-SWPPP must be retained at the construction site or a nearby location easily accessible during normal business hours, from the date of commencement of construction activities to the date that final stabilization is reached.

If a location within the construction site is unavailable to store the OS-SWPPP when no personnel are present, notice of the plan's location, along with any updated contact information, must be posted near the main entrance at the construction site.

Contractors, who have day-to-day operational control over OS-SWPPP implementation, must have a copy of this SWPPP available at a central location within the construction site for the use by all those identified as having responsibilities under the OS-SWPPP.

OS-SWPPPs must be made available upon request and at the time of a construction site inspection by EPA, DHEC, local government officials, and the Operator of a Municipal Separate Storm Sewer System (MS4).

3.2. Pre-Construction Conferences

Prior to any construction activity, the Contractor shall schedule and organize an on-site Stormwater Pre-Construction Conference. Each contractor or subcontractor, who will work at the site, must attend this conference in person.

The Contractor shall invite the Owner, Engineer, Contracting Officer (if applicable) and agencies listed below to the Stormwater Pre-Construction Conference. The Contractor must invite the noted agencies to the meeting at least 7 days prior to conducting the meeting.

SCDHEC Permitting Section SCDHEC Bureau of Water 2600 Bull Street Columbia, SC 29201 (803) 898-4005	**MS4 - York County Government** 1070 Heckle Blvd. Suite 107 Rock Hill, SC 29732 (803) 909-7200

3.3. Inspection Requirements

The General Contractor shall be responsible for all SWPPP inspections. Inspections shall include the following:

1. All areas of the site disturbed by construction activity and areas used for storage of materials that are exposed to precipitation;
2. All stormwater conveyance systems for any evidence of, or the potential for, pollutants entering these systems;
3. All BMPs identified in the OS-SWPPP;
4. All discharge locations to ascertain whether the implemented BMPs are effective in preventing the discharge of sediment from the site. Where discharge locations are inaccessible, nearby downstream locations must be inspected to the extent that such inspections are practicable; and
5. Locations where vehicles enter or exit the site must be inspected for evidence of off-site sediment tracking.

Inspection Frequency

After construction activities begin, inspections must be conducted at a minimum of at least once every calendar week and must be conducted until final stabilization is reached on all areas of the construction site. An inspection is recommended within 24 hours of the end of a storm event of 0.5 inches or greater.

Inspector Qualifications

Inspections must be conducted by qualified personnel (provided by the General Contractor). "Qualified Personnel" means a person knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact stormwater quality and to assess the effectiveness of any BMPs selected to control the quality of stormwater discharges from the construction site. This person must be an individual who has been certified through a Construction Site Inspector Certification Course that has been approved by DHEC. Inspections may also be conducted by a person with a registration equivalent to the registration of the preparer of the C-SWPPP (professional engineer).

3.4. Maintenance Requirements

Proper maintenance of post-construction water quality BMP's and drainage systems is required to ensure they continue to function as designed and permitted. Maintenance activities shall be performed as follows:

System	Maintenance Requirements	Maintenance Frequency
A. Vegetated Areas	1. Mow Grass	1. Monthly
	2. Remove all litter and debris	2. Monthly
	3. Remove and replace dead or diseased vegetation	3. Semi-Annually
	4. Replace / Replenish mulch.	4. Semi-Annually
	5. Remove weeds.	5. Semi-Annually
	6. Prune vegetation to maintain appearance	6. Semi-Annually
B. Storm Drainage System	1. Remove all litter and debris from pipes.	1. Annually
	2. Remove sediment from drainage structure sumps	2. Annually, or when sump volume has been reduced by 50%.
C. Grass Lined Ditches and Swales	1. Mow swale slopes	1. Monthly
	2. Remove all litter and debris	2. Monthly
	3. Repair side slopes.	3. Annually
	4. Remove sediment buildup within bottom of swale	4. Annually, or when swale volume has been reduced by 25%
D. Energy Dissipaters	1. Remove all litter and debris	1. Monthly
	2. Repair erosion or damaged dissipaters.	2. Annually
E. Vegetated Filter Strips	1. Mow grass	1. Monthly
	2. Remove all litter and debris	2. Monthly
	3. Repair erosion and rills	3. Annually
	4. Repair sparse vegetation	4. Annually

3.5. Record Keeping

Any logs necessary to track the progress, compliance, modifications and those associated with the construction site. These logs may include, but are not limited to, a pre-construction conference log, an inspection log, a stabilization log, a rain log, a contractor log and/or any additional record keeping as deemed necessary by the Permittee, Contractor, DHEC, MS4, or an entity delegated under Regulation 72-300.

3.6. Final Stabilization

Final site stabilization is achieved when perennial vegetative cover provides permanent stabilization with a density greater than 80 percent over the entire area to be stabilized by vegetative cover. This area is exclusive of areas that are covered with rock (crushed granite, gravel, etc.) or landscape mulch, paved or have a building or other permanent structure on them.

SECTION 31 31 16 - TERMITE CONTROL

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. Soil and wood treatment with termiticide.

B. Related Sections:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood preservative treatment by pressure process.

1.3 SUBMITTALS

A. Product Data: For each type of termite control product.

1. Include the EPA-Registered Label for termiticide products.

B. Qualification Data: For qualified Installer.

C. Product Certificates: For termite control products, from manufacturer.

D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Termiticide brand name and manufacturer.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes used, and rates of application.
6. Areas of application.
7. Water source for application.

E. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located, and who employs workers trained and approved by manufacturer to install manufacturer's products.

B. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

B. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

C. Apply wood treatment after framing, sheathing, and exterior weather protection is completed but before electrical and mechanical systems are installed.

1.6 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

A. Termiticide: Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Corporation, Agricultural Products; Termidor. (Basis-of-Design)
b. Bayer Environmental Science.
c. Syngenta.

2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

2.2 WOOD TREATMENT

A. Borate: Provide an EPA-Registered borate temiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution for spray application and a gel solution for pressure injection, formulated to prevent termite infestation in wood. Provide quantity required for application at the label volume and rate for the maximum diffusible borate concentration allowed for each specific use, according to product's EPA-Registered Label.

1. Products: Subject to compliance with requirements, provide the following:

a. Nisus Corp.; Bora-Care Jecta Tim-Bor.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Adjacent soil, including soil along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
3. Masonry: Treat voids.

4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

D. Post warning signs in areas of application.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.5 APPLYING WOOD TREATMENT

A. Application: Mix wood treatment solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of borate, according to manufacturer's EPA-Registered Label, so that wood framing, sheathing, siding, and structural members subject to infestation receive treatment.

1. Framing and Sheathing: Apply termiticide solution by spray to bare wood for complete coverage.

END OF SECTION 31 31 16

SECTION 313700 - RIP RAP

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers materials, labor, and equipment for placement of rip rap for slope protection and erosion control as indicated on the drawings and as specified.

1.2 SUBMITTALS

A. None this section.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

1.4 REGULATORY REQUIREMENTS

A. Comply with federal, state, and local regulations.

B. Comply with the requirements of the land disturbance permit and approved plans issued for this project by South Carolina Department of Health and Environmental Control (SCDHEC) and/or the MS4.

1.5 CRITERIA FOR BIDDING

A. Lump Sum Bid

1. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which is it associated and shall be included in the lump sum price. The price shall be full compensation for all material, equipment, labor, testing, construction supervision and all other work required for satisfactory completion of rip rap placement.

B. Unit Prices

1. None this Section.

1.6 QUALITY ASSURANCE

A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.

B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.

C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.

D. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 RIP RAP

1. Rip rap shall be hard quarry or field stone and shall be of such quality that they will not disintegrate on exposure to water and weather. The stone shall range in weight from a minimum of 25 pounds to a maximum of 150 pounds. At least 20 percent of the stone pieces shall weigh more than 60 pounds. The stone pieces shall have a minimum dimension of 12 inches.
2. The stone analysis, source and other pertinent data shall be submitted for review by the Engineer prior to delivery.

PART 3 - EXECUTION

3.1 SITE PREPARATION

A. The rip rap shall be placed in the manner and at the locations shown on the drawings. The surface to receive the rip rap shall be prepared to a relatively smooth condition free of obstructions, depressions, debris, and soft or low-density pockets of material. The contours and elevations shown on the drawings are to the surface of the stone.

3.2 PLACEMENT

A. The minimum thickness or depth of stone layer shall be 12 inches. Placing shall begin in a trench at the bottom of the slope with the filter fabric wrapped in stone at least 5 feet up the slope. The entire mass of stone shall be placed so as to be in conformance with the lines, grades, and thicknesses shown on the plans. Rip rap shall be placed to its full course thickness at one operations and in such a manner as to avoid displacing the underlying material.

B. Placing of rip rap in layers, or by dumping into chutes, or by similar methods likely to cause segregation will not be permitted.

C. The larger stones shall be well distributed, and the entire mass of stone shall conform to the gradation specified. All material going into rip rap protection shall be so placed and distributed that there will be no large accumulations of either the larger or smaller sizes on stone.

D. At no time during placement of the stones on top of the filter fabric shall they be dropped from a height greater than three feet.

3.3 INSPECTIONS

A. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the

Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.

B. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours notice for all required observations or tests.

C. Acceptance

1. Final acceptance will be based on satisfactory placement of rip rap as approved by the Engineer. Rip rap shall be re-worked to the satisfaction of the Engineer until specified requirements are met.
2. All additional work, which is the result of a failed inspection, shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 313700

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers all work associated with:
   1. Aggregate Base Course
   2. Intermediate Course
   3. Prime Coat
   4. Tack Coat
   5. Asphaltic Concrete

1.2 DEFINITIONS

A. Compaction: The process of mechanically stabilizing a material by increasing its density. “Degree of Compaction” is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D 1557 for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials, abbreviated in this specification as “___ percent maximum density.” “Degree of Compaction” is expressed as a percentage of the maximum density obtained by the test procedure ASTM D 1188 or ASTM D 2726 “___ percent maximum density for asphaltic concrete.”

B. Course: A layer or lift of soil or asphaltic concrete placed on top of a previously prepared or placed surface.

C. Lift: A layer or course of soil or asphaltic concrete placed on top of a previously prepared or placed surface.

D. Subgrade: Existing, in-situ soil or other material that is remaining after stripping or excavation. The subgrade is always existing material on which fill, or new structures are to be placed.

1.3 SUBMITTALS

A. Asphaltic Concrete Mix Design: For each mix to be used on the project by course, submit a mix design prepared within 12 months of the date of the submittal.

   1. Mix designs in compliance with requirements of the “South Carolina State Highway Department Standard Specification for Highway Construction”. Mix design shall bear the approval of the South Carolina State Highway Department and shall be dated within 12 months of the date of the submittal. All materials listed in the mix design shall be the materials used to produce the asphaltic concrete.

B. Laboratory Testing: Submit laboratory testing data for approval as identified in the paragraph titled “Laboratory Testing” for any the following materials to be used on the project before any material is delivered to the site.

   1. Graded Aggregate Base Course

      a. Maximum density

   2. Asphaltic Concrete (intermediate course and surface course)

      a. Maximum density

C. Field Testing: Submit field testing data as identified in the paragraph titled “Field Testing” for the following:

1. Aggregate Base Course

    a. In place densities
    b. Grade
    c. Straight Edge

2. Asphaltic Concrete (intermediate course and surface course)

    a. In place density
    b. Mix Design Compliance
    c. Grade
    d. Straight Edge

D. Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for the following:

1. Aggregate Base Course
2. Tack coat
3. Prime coat
4. Asphaltic Concrete (intermediate course and surface course)

    a. Coarse aggregate
    b. Fine aggregate
    c. Mineral filler
    d. Asphalt cement

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

1.5 REGULATORY REQUIREMENTS

A. Comply with federal, state and local regulatory requirements.

1.6 CRITERIA FOR BIDDING

A. Lump Sum Price

1. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which is it associated and shall be included in the lump sum price. The price shall be full compensation for the material, compaction, shaping, finishing, dressing, disposal of surplus material, testing, construction supervision and all other work required for satisfactory completion of the asphaltic concrete pavement system.

B. Unit Prices

1. Payment for the unit shown on the bid form shall be considered to cover the cost of all labor, material, equipment, testing, and performing all operations necessary to complete the work in place. Payment shall be made based upon the actual quantity multiplied by the unit prices.

2. Measurement will be made by means acceptable to the Owner and the Engineer. Actual amounts less than these figures will be deducted from the contract price at the unit price established in the allowance section. Amounts greater than the allowance will be added to the contract price.

1.7 QUALITY ASSURANCE

A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.

B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.

C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.

D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.

E. Environmental Conditions: Place bituminous mixture only during dry weather and on dry surfaces. Place asphaltic concrete only when surface temperature of underlying course is greater than 45 degrees F for course thicknesses greater than one inch and 55 degrees F for course thickness' one inch or less.

F. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 BASE COURSE

A. Graded Aggregate Base Course

1. Shall comply with requirements for Graded Aggregate Base Course as specified in Section 305 of the "South Carolina Department of Transportation Standard Specification for Highway Construction" and addendums.

2.2 PRIME COAT

A. Shall comply with requirement for Prime Coat specified in Section 305 of the "South Carolina Department of Transportation Standard Specification for Highway Construction".

2.3 TACK COAT

A. Shall comply with requirement for Tack Coat specified in Section 401 of the "South Carolina Department of Transportation Standard Specification for Highway Construction".

2.4 ASPHALTIC CONCRETE

A. Shall be hot mixed, hot laid asphaltic concrete of the compacted thickness indicated and shall be one of the following:

B. Intermediate course

1. Shall comply with requirements for Hot Mix Asphalt Intermediate course Type C as specified in Sections 401 and 402 of the "South Carolina Department of Transportation Standard Specification for Highway Construction".

C. Surface Course:

1. Shall comply with requirements for Hot Mix Asphalt Surface Course Type C as specified in Sections 401 and 403 of the "South Carolina Department of Transportation Standard Specification for Highway Construction".

PART 3 - EXECUTION

3.1 SAWCUTTING OF EXISTING PAVEMENTS

A. Provide full depth sawcuts through existing asphaltic concrete pavements where new asphaltic concrete pavements are to join. Sawcuts shall be straight and vertical and shall be located a minimum of 3 inches from the existing edge or as indicated on the drawings.

3.2 PREPARATION OF SUBGRADE OR FILL

A. Prepare subgrade and/or fill as specified in SECTION "EARTH MOVING".

3.3 BASE COURSES

A. Graded Aggregate Base Course

1. Placement

a. Place aggregate base on prepared subgrade or fill in maximum loose lifts of 8 inches. Do not place on surfaces that are muddy, frozen or that contain frost. Total thickness shall be as indicated. Compact with equipment well suited for material being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment being used. Compact each lift as specified herein prior to placing the overlaying lift.

2. Compaction

a. Compact the base course through the full depth to not less than 100 percent of maximum laboratory density.

3. Tolerances

a. Finished grade of base course shall be within 0.05 feet of indicated finish grade.
b. Finished surface of base course shall not vary more than 3/8 inch when tested with a 10-foot straightedge.

c. Finished thickness of base course shall not vary more than one-half inch from the required thickness at any point and the average of all depth measurements shall be at least that indicated.
d. Areas not meeting the specified requirements will be rejected until corrected by the Contractor

4. Protection

a. Graded areas shall be protected from traffic, erosion, settlement, or any washing away that may occur from any cause prior to acceptance. Any repair or reestablishment of final grades shall be made prior to final acceptance.

3.4 PRIME COAT

A. Application

1. Apply not more than 0.28 gallon per square yard nor less than 0.25 gallon per square yard to the completed and accepted base course after receiving approval from the Engineer for priming. Where base consists of fossilferous limestone, the prime rate shall be not more than 0.15 gallons per square yard nor less than 0.10 gallons per square yard. The prime shall only be applied when the base course is only slightly damp, and when temperature of the air in the shade is 55 degrees F or above. In places where the distributor bars cannot reach, it will be necessary to apply the prime coat with a hand sprayer attached to the distributor by a hose.

B. Protection

1. Do not permit traffic on the primed area until the prime coat has cured adequately.

3.5 TACK COAT

A. Application

1. Apply not more than 0.15-gallon square yard nor less than 0.05 gallon per square yard to indicated contact surfaces. Net rate of application shall be 0.10 gallon per square yard of net bitumen. Apply half-rate application to prime coats that have been contaminated by traffic or dust. The tack coat shall only be applied when the contact surface is dry and when the temperature has not been below 35 degrees F for 12 hours immediately prior to application. The tack coat shall only be applied when the temperature of the air in the shade is 55 degrees F or above. Work shall be planned so that no more tack coat than is necessary for the day's operation is placed on the surface. In places where the distributor bars cannot reach, it will be necessary to apply the tack coat with a hand sprayer attached to the distributor by a hose. When hand spray methods are used, care should be taken to give the surface a very light application of the asphalt.

B. Protection

1. Except paving equipment, do not permit any traffic on tacked surfaces.

3.6 ASPHALTIC CONCRETE

A. Mixing and Preparation of Bituminous Mixture

1. Plant mix bituminous mixture to comply with requirements specified herein.

B. Transportation of Bituminous Mixture

1. Transport bituminous mixture in trucks having, tight, clean, smooth beds that have been coated with a minimum amount of a concentrated solution of hydrated lime and water to prevent adhesion of the mixture to the truck bodies. Each load shall be covered with canvas or other approved material of ample size to protect he mixture from the weather and to prevent loss of heat. Deliveries shall be made so that the spreading and rolling of all mixture prepared for one day's run can be completed during daylight, unless adequate, approved artificial lighting is provided. The mixture shall be delivered to the area to be paved in such a manner that the temperature at the time of dumping into the spreader will not be less than 250 degrees F. Any loads that are below minimum temperature, that have crusts of cold, unworkable material, or that have been wet excessively by rain will be rejected. Hauling over freshly laid material will not be permitted.

C. Machine Spreading

1. Prior to the laying of the asphaltic concrete, clean underlying course of foreign or objectionable matter with power blowers or power brooms, supplemented by hand brooms and other cleaning methods where necessary.
2. The range of temperatures of the mixtures at the time of spreading shall be between 250 degrees F and 300 degrees F. Bituminous concrete having temperatures less than minimum spreading temperature when dumped into the spreader will be rejected. Adjust spreader and regulate speed so that the surface of the course is smooth and continuous without tears and pulling, and of such depth that, when compacted, the surface conforms with the cross section, grade, and contour indicated. Unless otherwise directed, begin the placing along the centerline of areas to be paved on a crowned section or on the high side of areas with a one-way slope. Place mixture in consecutive adjacent strips having a minimum width of 10 feet, except where the edge lanes require strips less than 10 feet to complete the area. Construct longitudinal joints and edges to true line markings. Establish lines parallel to the centerline of the area to be paved, and place string lines coinciding with the established lines for the spreading machine to follow. Provide the number and location of the lines needed to accomplish proper grade control. When specified grade and smoothness requirements can be met for initial lane construction by use of an approved long ski-type device of not less than 30 feet in length and for subsequent lane construction by use of a short ski or shoe, in-place string lines for grade control may be omitted. Place mixture as nearly continuous as possible and adjust the speed of placing as needed to permit proper rolling

D. Shoveling, Raking, and Tamping After Machine Spreading

1. Shovelers and rakers shall follow the spreading machine. Add or remove hot mixture and rake the mixture as required to obtain a course that when completed will conform to requirements specified herein. Broadcasting or fanning of mixture over areas being compacted is prohibited. When segregation occurs in the mixture during placing, suspend spreading operation until the cause is determined and corrected. Correct irregularities in alignment left by the spreader by trimming directly behind the machine. Immediately after trimming, compact edges of the course by tamping laterally with a metal lute or by other approved methods. Distortion of the course during tamping is prohibited.

E. Hand Spreading in Lieu of Machine Spreading

1. In areas where the use of machine spreading is impractical, spread mixture by hand. The range of temperatures of the mixtures when dumped onto the area to be paved shall be between 250 and 300 degrees F. Mixtures having temperatures less than minimum spreading temperature when dumped onto the area to be paved will be rejected. Spread hot mixture with rakes in a uniformly loose layer of a thickness that, when compacted, will conform to the required grade, thickness, and smoothness. During hand spreading, place each shovel full of mixture by turning the shovel over in a manner that will prevent segregation. Do not place mixture by throwing or broadcasting from a shovel. Do not dump loads any faster than can be properly handled by the shovelers and rakers.

F. Compaction of Mixture

1. Compact mixture by rolling. Begin rolling as soon as placement of mixture will bear rollers. Delays in rolling freshly spread mixture shall not be permitted. Start rolling longitudinally at the extreme sides of the lanes

and proceed toward center of pavement, or toward high side of pavement with a one-way slope. Operate rollers so that each trip overlaps the previous adjacent strip by at least one foot. Alternate trips of the roller shall be of slightly different lengths. Conduct tests for conformity with the specified crown, grade and smoothness immediately after initial rolling. Before continuing rolling, correct variations by removing or adding materials as necessary. If required, subject course to diagonal rolling with the steel wheeled roller crossing the lines of the previous rolling while mixture is hot and in a compactible condition. Speed of the rollers shall be slow enough to avoid displacement of hot mixture. Correct displacement of mixture immediately by use of rakes and fresh mixture or remove and replace mixture as directed. Continue rolling until roller marks are eliminated and course has a density of at least 96 percent but not more than 100 percent of that attained in a laboratory specimen of the same mixture prepared in accordance with ASTM D 1559. During rolling, moisten wheels of the rollers enough to prevent adhesion of mixture to wheels, but excessive water is prohibited. Operation of rollers shall be by competent and experienced operators. Provide sufficient rollers for each spreading machine in operation on the job and to handle plant output. In places not accessible to the rollers, compact mixture thoroughly with hot hand tampers. Skin patching of an area after compaction is prohibited. Remove mixture that becomes mixed with foreign materials or is defective and replace with fresh mixture compacted to the density specified herein. Roller shall pass over unprotected edge of the course only when laying of course is to be discontinued for such length of time as to permit mixture to become cold.

G. Tolerances

1. Finished grade of asphaltic concrete shall be within 0.03 feet of indicated finish grade.
2. Finished surface shall not vary more than 1/8 inch when tested with a 10-foot straightedge.
3. The finished thickness shall not vary more than 1/4 inch from required thickness at any point and average thickness of depth measurements shall be at least the thickness indicated.
4. The finished surface shall be uniform in appearance and texture over the entire surface, including at joints. The entire surface shall be free of evidence of segregation, honeycombs and back scattering.
5. Areas not meeting the above requirements will be rejected until corrected by the Contractor.

H. Joints

1. Joints shall present the same texture and smoothness as other portions of the course, except permissible density at the joint may be up to 2 percent less than the specified course density. Carefully make joints between old and new pavement or within new pavements in a manner to ensure a thorough and continuous bond between old and new sections of the course. Vertical contact surfaces of previously constructed sections that are coated with dust, sand, or other objectionable material shall be painted with a thin uniform coat of emulsion or other approved bituminous material just before placing fresh mixture.

2. Transverse Joints

   a. Roller shall pass over unprotected end of freshly laid mixture only when laying of course is to be discontinued. Except when an approved bulkhead is used, cut back the edge of previously laid course to expose an even, vertical surface for the full thickness of the course. When required, rake fresh mixture against joints, thoroughly tamp with hot tampers, smooth with hot smoothers, and roll. Transverse joints in adjacent lanes shall be offset a minimum of 2 feet.

3. Longitudinal Joints

   a. Space 6 inches apart. Do not allow joints to coincide with joints of existing pavement or previously placed courses. Spreader screed shall overlap previously placed lanes 2 to 3 inches and be of such height to permit compaction to produce a smooth dense joint. With a lute, push back mixture placed on the surface of previous lanes to the joint edge. Do not scatter mix. Remove and waste excess material. When edges of longitudinal joints are irregular, honeycombed, or poorly compacted, cut back unsatisfactory sections of joint and expose an even vertical surface for the full thickness of the course. When required, rake fresh mixture against joint, thoroughly tamp with hot tampers, smooth with hot smoothers, and roll while hot.

I. Protection

1. Do not permit traffic, including heavy equipment, on asphaltic concrete until surface temperature has cooled to at least 120 degrees F.

3.7 PROTECTION

A. Existing Pavement

1. Protect existing pavements to remain from damage. Movement of construction machinery and equipment over existing pavements during construction shall be at the Contractor's risk. Existing pavements damaged by the contractor's operations shall repaired or replaced to their original condition at the contractor's expense.

B. Erosion Control

1. Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the contract drawings.

C. Existing Utilities

1. Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall contact the local utility location company or each applicable utility company as required for assistance in locating existing utilities.

D. Structures and surfaces

1. Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance.

3.8 INSPECTION AND TESTING

A. Inspections

1. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.
2. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours notice for all required observations or tests.

B. Testing

1. All testing shall be made at the Owner's expense. Test locations shall be approved by the Engineer.

2. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.

3. The testing laboratory, Engineer and Owner shall be given a minimum of 72 hours notice for all tests. Testing Agencies - Testing shall be done by a testing laboratory which operates in accordance with ASTM E-329 (latest revision) and approved by the Engineer prior to engagement. Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test. Agencies to be used shall be submitted to the Engineer for review prior to engagement.

4. Laboratory Testing
   a. Graded Aggregate Base Course
      1) Laboratory testing for maximum density and optimum moisture content shall be performed in accordance with ASTM D 1557 or ASTM D 698 for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials.
      2) Aggregate Base - One maximum density and optimum moisture content test for each source.

5. Field testing

   a. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. The Owner, Engineer, and Contractor shall be provided copies of reports within 72 hours of the time the test was performed. In the event that any test performed fails to meet these specifications, the Owner, Engineer, and Contractor shall be notified immediately by Independent Testing Laboratory. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary. The Contractor shall provide free access to the site for testing activities.

   b. Graded Aggregate Base Courses:

      1) In-place density – 1 per 1000 square yards per course and per lift - in accordance with one of the following:

         a) Sand Cone Method - ASTM D 1556
         b) Balloon Method - ASTM D 2167
         c) Nuclear Method - ASTM D 2922

      2) Grade - entire site. (50 feet grid maximum)
      3) Straightedge - entire site (25 feet grid maximum)

   c. Asphaltic Concrete (Intermediate course and Surface Course):

      1) Maximum density of compacted asphaltic concrete shall be determined in accordance with ASTM D 1188 or ASTM D 2726.

         a) One density test for each batch, but no less than one test for each 250 tons of asphaltic concrete produced or fraction thereof of asphalt produced.

      2) Mix design compliance - Test asphaltic concrete produced for compliance with the approved mix design in accordance with the Marshall Method for Mix Design in the Asphalt Institute Manual Series No. 2 (MS-2).

         a) One analysis for each batch, but no less than one analysis for each 250 tons of asphaltic concrete produced or fraction thereof of asphalt produced.

      3) In place density - 1 per 1000 square yards per course and per lift - in accordance with one of the following:

a) ASTM D 2950
b) Determine by taking 4" diameter cores obtained from intermediate course and surface course. Separate course by sawing. Determine in-place density of cores in accordance ASTM D 1188 or ASTM D 2726.

4) Grade - entire site. (50 feet grid maximum)
5) Straightedge - entire site (25 feet grid maximum)

C. Acceptance

1. In the event that a tested material does not meet or exceed the specified requirements, the Contractor shall perform additional testing as directed by the Engineer to adequately define the limits of the material not meeting the specifications. Materials shall be re-tested to the satisfaction of the Engineer until specified requirements are met.
2. All additional testing and work, which is the result of a failed test, shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers all materials, labor and equipment for jointed, portland cement concrete pavement including base course and joint sealing and all associated materials and work.

1.2 DEFINITIONS

A. Compaction: The process of mechanically stabilizing a material by increasing its density. “Degree of Compaction” is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM [D698][D1557] for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials, abbreviated in this specification as “___ percent maximum density.”

B. Lift: A layer or course of soil placed on top of a previously prepared or placed surface.

C. Subgrade: Existing, in-situ soil or other material that is remaining after stripping or excavation. The subgrade is always existing material on which fill or new structures are to be placed.

1.3 LUMP SUM PRICE

A. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which is it associated and shall be included in the lump sum price. The price shall be full compensation for the material, compaction, shaping, finishing, dressing, disposal of surplus material, testing construction supervision and all other work required for satisfactory completion of concrete pavement.

1.4 UNIT PRICES

A. None this Section.

1.5 OPTIONS

A. As specified herein, options are provided for use of materials specified in the applicable sections of the “South Carolina Department of Transportation Standard Specifications for Highway Construction (SCDOT SSHC)”. Execution, administration, contractual and payment provisions do not apply. Where the term “State” is used, it shall mean “Owner.”

1.6 SUBMITTALS

A. Mix Designs

1. Submit a design mix for each class of concrete proposed for use. The mix shall be prepared by an approved testing laboratory. Compressive strength of at least 4 test cylinders of the design mix shall indicate 15% higher than 28 days strength specified.

B. Laboratory Testing: Submit laboratory testing data for approval as identified in the paragraph titled “Laboratory Testing” for any the following materials to be used prior to any material is delivered to the site.

1. Aggregate Base: Maximum density.

C. Field Testing: Submit field testing data as identified in the paragraph titled “Field Testing” for the following:

1. Aggregate Base: In place density.
2. Portland Cement Concrete: Compressive Strength Tests (7 day and 28 day).

D. Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for the following:

1. Aggregate Base

2. Portland Cement Concrete

   a. Aggregate
   b. Admixtures
   c. Cement

3. Joints

   a. Sealant
   b. Filler

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

1.8 REGULATORY REQUIREMENTS

A. Comply with all federal, state and local regulatory requirements.

1.9 QUALITY ASSURANCE

A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.

B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.

C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Owner and/or Engineer, a list of projects and the contacts who are familiar with his competence may be required to be submitted to verify experience.

D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.

E. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE

A. Blend of coarse aggregate and binder material to form a uniform base having a minimum CBR of at least 80 at 95% maximum laboratory density determined in accordance with ASTM D1883. Material retained on the No. 10 sieve shall be designated coarse aggregate and material passing the No. 10 sieve shall be designated binder material.

1. Binder material shall consist of local sand or crushed coarse aggregate, from sources approved by the Engineer. The portion of material passing the No. 40 sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than 6 determined by ASTM D4318.
2. Coarse Aggregate: ASTM C 33.
3. Mixture of coarse aggregate and binder material shall conform to the following gradation when tested in accordance with ASTM C136:

Sieve Size	Percent by Weight Passing
2 inch	100
1.5 inch	95-100
1 inch	70-100
0.5 inch	50-80
#4	35-55
#30	12-31
#200	6-15
Clay	0 to 25
Volume Change	0 to 15
Liquid Limit	0 to 25
Plasticity Index	0 to 6

B. In accordance with “South Carolina State Highway Department Standard Specification for Highway Construction”, Section 305 - Aggregate Base Course.

2.2 FORMS

A. Shall be wood, plywood, metal, or other qualified material and shall be of the grade or type suitable to obtain the finish specified. Forms shall be constructed to the shape, for line, and grade required, and shall be maintained sufficiently rigid to prevent deformation under load.

B. Form work and details construction shall conform to Chapter 6 of ACI 318.

2.3 REINFORCEMENT

A. Dowel Bars: ASTM A615, Grade 40 or 60, plain billeted steel bars. Remove all burrs and projections from the bars. Coat sliding portion of each bar with shop applied paint. For doweled expansion joints, fit the outer end of the sliding portion of each dowel bar with a tight-fitting metal sleeve which conforms to manufacturer’s recommendations for dowel bars.

B. Tie Bars: ASTM A615, Grade 40 or 60, billeted or axle steel deformed bars.

C. Reinforcement

1. Reinforcing Steel: ASTM A615, Grade 60.
2. Mesh Reinforcement: ASTM A1064, flat sheets.

2.4 JOINT MATERIALS

A. Blocking Media: Compressible, non-shrinkable, non-reactive with joint sealant and non-absorption type such as plastic rod, free of oils or bitumens. Blocking media shall have a water absorption of not more than 5% by weight when tested in accordance with ASTM C509. Blocking media shall be consistent with the joint sealant manufacturers installation instructions and be at least 25% larger in diameter than the width of the joint being sealed.

B. Preformed Joint Filler: ASTM D1751 or ASTM D1752 Type II or III. Filler must be compatible with sealant.

C. Liquid Joint Sealant: Self-leveling silicone joint sealant such as Dow Corning 890SL or approved equal.

D. Preformed Compression Seals

1. ASTM D2628. Size as recommended by the manufacturer for the joint being sealed.
2. Primer/lubricant/adhesive as recommended by the manufacturer.

2.5 CURING MATERIALS

A. Impervious Sheeting: ASTM C171 with minimum sheet thickness of 10 mils. Non-reactive with other materials such as curing compound.

B. Liquid Membrane-Forming Compound: ASTM C309, white pigmented, Type 2, Class A or B.

2.6 PORTLAND CEMENT CONCRETE

A. Mix Materials

1. Cement: ASTM C150 Type I or II.
2. Water: Shall be clean, fresh and potable.
3. Aggregates: ASTM C33
4. Admixtures: Where not shown or specified, the use of admixtures is subject to the written approval of the Engineer.

    a. Air Entraining: ASTM C260. Use in all portland cement concrete pavement.
    b. Retarding: ASTM C494, Type B or D.
    c. Accelerating: ASTM D98.
    d. Water Reducing: ASTM C494.
    e. Fly Ash and Pozzolans: ASTM C618: Types N, F, or C.
    f. Ground Iron Blast Furnace Slag: ASTM C989: Grade 120.

B. Mix Properties

1. Design Mix in accordance with ACI 211.1. Concrete shall conform to the following:

    a. Minimum Compressive Strength (28 days): 4,000 psi.
    b. Maximum Aggregate Size: 1.5 inches.
    c. Minimum Cement Content: 517 lbs./CY.
    d. Maximum Water Cement Ratio: 0.5, by weight.

e. Range in Slump: 1 – 3 inches.
f. Allowable Air Content: 5, +/- 1.5%, by volume.

2. The minimum cement content is required for durable concrete with local aggregates but may be insufficient to obtain the specified strength, in which case, increase the cement content as necessary, without additional compensation under this contract.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE OR FILL

A. Water shall be removed from excavations before concrete is deposited. Hardened concrete debris and other foreign materials shall be removed from the interior of forms and from the inside of mixing and conveying equipment. The reinforcement shall be made secure in position and shall be subject to examination and approval.

B. Prepare subgrade or fill as specified in specification Section “EARTH MOVING”.

3.2 AGGREGATE BASE COURSE

A. Placement: Place aggregate base on prepared subgrade or fill in maximum loose lifts of 8 inches. Do not place on surfaces that are muddy, frozen or that contain frost. Total thickness shall be as indicated. Compact with equipment well suited for material being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment being used. Compact each lift as specified herein prior to placing the overlaying lift.

B. Compaction: Compact the base course through the full depth to not less than 100% of maximum laboratory density.

C. Tolerances

1. Finished grade of base course shall be within 0.05 feet of indicated finish grade.
2. Finished surface of base course shall not vary more than 0.375 inch when tested with a 10 foot straightedge.
3. Finished thickness of base course shall not vary more than 0.5 inches from the required thickness at any point and the average of all depth measurements shall be at least that indicated.
4. Areas not meeting the specified requirements will be rejected until corrected by the Contractor.

D. Protection: Graded areas shall be protected from traffic, erosion, settlement, or any washing away that may occur from any cause prior to acceptance. Any repair or re-establishment of final grades shall be made prior to final acceptance.

3.3 FORMS

A. Construct forms to be removable without damaging the concrete.

B. Coating: Before placing the concrete, coat the contact surfaces of forms, (except existing pavement sections where bonding is required) with a non-staining mineral oil, non-staining form coating compound, or two coats of nitro-cellulose lacquer. When using existing pavement as a form, clean existing concrete and then coat with an asphalt emulsion bondbreaker before concrete is placed.

C. Grade and Alignment: Check and correct grade elevations and alignment of the forms immediately before placing the concrete.

3.4 REINFORCEMENT

A. Dowel Bars: Install bars accurately aligned, vertically and horizontally, at indicated locations and dimensions. Dowel alignment shall not exceed 0.125 inch per foot from perpendicular to joint face. Before installation, thoroughly grease the sliding portion of each dowel.

B. Tie Bars: Install bars, accurately aligned, vertically and horizontally at indicated locations. For slipform construction, insert bent tie bars by hand or other approved means.

C. Slab Reinforcement

1. Placement: Place reinforcement on suitable chairs prior to concrete placement or depress the reinforcement into the plastic concrete to the required elevation after concrete has been spread.
2. Laps and Splices: Minimum 12 inches.
3. Joints: Place reinforcement at joints as indicated on drawings.

3.5 MEASURING, MIXING, CONVEYING, AND PLACEMENT CONCRETE

A. Measuring: ASTM C94.

B. Mixing: ASTM C94, except as modified herein. Begin mixing within 30 minutes after cement has been added to aggregates. When air temperature is greater than 85°F, reduce mixing time and place concrete within 60 minutes. Additional water may be added to bring slump within the required limits specified, provided that the specified water/cement ratio is not exceeded.

C. Conveying: ASTM C94.

D. Placing: ACI 301, except as modified herein. Do not exceed vertical drop of 3 feet from point of discharge.

E. Vibration: Immediately after spreading concrete, consolidate concrete with internal type vibrating equipment along the boundaries of all slabs regardless of slab thickness, and interior of all slabs 6 inches or more in thickness. Limit duration of vibration to that necessary to produce consolidation of concrete. Excessive vibration will not be allowed. Vibrators shall be operated at any one location for more than 15 seconds. With approval from the Engineer, alternative vibration equipment may be utilized on unreinforced pavements less than 6 inches in thickness.

F. Cold Weather: Do not place concrete when ambient temperature is below 40°F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Obtain written approval from the Engineer if it becomes necessary to place concrete in cold weather conditions that exceed these limitations and in such cases follow the practices found in ACI 306.1.

G. Hot Weather: Maintain required concrete temperature in accordance with Figure 2.1.5 in ACI 305R to prevent evaporation rate from exceeding 0.2 pounds of water per square foot of exposed concrete per hour.

H. Finishing Concrete: Start finishing operations immediately after placement of concrete. Use finishing machine, except hand finishing may be used in emergencies and for slabs in inaccessible locations or of such shape or size that machine finishing is impractical. Transverse and longitudinal surface tolerances shall be 0.25 inches in 10 feet.

1. Side form finishing: Strike off and screed concrete to the required cross section by a power-driven transverse finishing machine. Elevation of concrete shall be such that, when consolidated and finished, pavement surface will be adequately consolidated and at the required grade. Equip finishing machine with two screeds which are readily and accurately adjustable for changes in pavement cross section and compensation for wear and other causes. Make as many passes as necessary to achieve the required compaction, retention of coarse aggregate at the surface, and surface of uniform texture, true to grade and

cross section. Do not permit excessive operation over an area, which will result in an excess of mortar and water being brought to the surface.

2. Equipment Operation: Maintain the travel of machine on the forms without lifting, wobbling or other variation of the machine which tend to affect the precision of the concrete finish. Keep tops of forms clean. During the first pass of the finishing machine, maintain a uniform ridge of concrete ahead of the front screed for its entire length.
3. Joint Finish: Before concrete is hardened, correct edge slump of pavement, exclusive of edge rounding, in excess of .02 foot. Finish pavement surfaces on both sides of a joint to the same grade. Finish formed joints from a securely supported transverse bridge. Correct deviations before newly placed concrete has hardened.
4. Hand Finishing: Strike off and screed surface of concrete to elevations slightly above finish grade so that when consolidated and finished, the pavement surface will be at the required grade. Vibrate the entire surface until the required compaction and reduction of surface voids is secured with a strike off template.
5. Longitudinal Floating: After initial finishing, further smooth and consolidate concrete by means of hand operated longitudinal floats. Use floats that are not less than 12 feet long and 6 inches wide and stiffened to prevent flexing and warping.
6. Surface Finish

    a. Plastic Grooving: After surface irregularities have been removed, give the concrete surface a uniformly roughened finish by use of a wire comb or other approved texturing device similar to a wire comb. Prior to plastic grooving, make one pass with burlap drag in the longitudinal direction. Complete grooving while concrete surface is in such condition that it will not be torn or unduly roughened, and before surface has obtained its initial set. Texture small irregular areas, or areas not suitable for machine texturing, with a hand operated device producing a textured surface equivalent to that required for machine combing.
    b. Burlap Drag Finish: Before concrete becomes non plastic, finish the surface of the slab by dragging on the surface a strip of clean, wet burlap measuring from 3 to 10 feet in length and 2 feet wider than the width of the pavement. Drag the surface to produce a finished surface with a fine granular or sandy texture without leaving disfiguring marks.
    c. Brooming: Finish the surface of the slab by brooming the surface with a new wire broom at least 18 inches wide. Gently pull the broom over the surface of the pavement form edge to edge just before the concrete becomes non plastic. Slightly overlap adjacent strokes of the broom. Broom perpendicular to centerline of the pavement so that the corrugations produced will be uniform in character and width and not more than 0.0625 inch in depth. Broomed surface shall be free form porous spots, irregularities, depressions, and small pockets or rough spots such as may be caused by accidentally disturbing particles of coarse aggregate embedded near the surface.
    d. Edging: At the time the concrete has attained a degree of hardness suitable for edging, carefully finish slab edges, including edges of formed joints, with an edge having a maximum radius of 0.125 inches. When brooming is specified as the final finish, edge transverse joints before starting brooming, then operate broom to obliterate as much as possible the marks left by the edging tool without disturbing the rounded corner left by the edger. Clean by removing loose fragments and soupy mortar for proper finishing. Refill voids solidly with a mixture of suitable proportions and consistency and refinish. Remove unnecessary tool marks and edges. Remaining edges shall be smooth and true to line.

3.6 JOINT SEALING

A. Equipment

1. Sandblasting: Sandblasting equipment shall include compressor, hose, and nozzles of proper size and shape to produce clean joints. Equip compressor with traps that will maintain compressed air free of oil and water.
2. Power Saws: Concrete saws shall be self-propelled and capable of sawing joints in concrete to indicated depths, width and alignment without spalling or raveling of concrete and at a production rate to avoid uncontrolled cracking.

3. Joint Sealing Equipment: In accordance with the sealant manufacturer's written instructions.

B. Joints

1. General: Joints shall be of the type and location shown on the drawings. Where curved pavement edges occur, make joints to intersect tangents to curve at right angles. Joints shall be in a continuous straight line extending from edge of pavement to edge of pavement. Do not stagger joints in abutting pavements except where shown. Protect joints from curing compounds by covering with tape or rope. Take necessary precautions to ensure proper curing at joints.
2. Sawing of Joints: Sawing will be conducted when concrete has hardened sufficiently to prevent raveling or flaking along edges of sawcut and before uncontrolled shrinkage cracking of pavement occurs. Time for joint sawing shall not exceed 12 hours from time of placement. Mark alignment of joints by chalk line or other suitable guide. Saw cuts shall not vary from required alignment by more than 0.5 inches in 10 feet. Sawcutting shall be carried on both during the night and day as required to prevent uncontrolled cracking. A supply of sawblades and at least one standby unit in working condition will be readily available during sawing operations. If uncontrolled cracking has occurred do not saw along the cracks, but notify the Engineer.
3. Protection of Joints: Immediately after each joint is sawed, thoroughly clean the saw cut and adjacent surface by flushing with water and blowing with compressed air to remove waste. Respray curing compound on surfaces affected by sawing and cleaning operations, but do not permit curing compound into the joints. Protect joints from intrusion of foreign materials by installation of blocking media as indicated or by other approved means. Do not seal joints until concrete has cured sufficiently as required by the sealant manufacturer's written instructions.
4. Joints at Vertical Surfaces: Construct joints where slabs abut light pads, catch basins, manholes, footings, walls, columns and structures as expansion joints, 0.75 inches wide and full depth of the pavement. Provide joints with preformed joint filler and sealant. Secure filler in place by bonding adhesive. Do not nail of stake filler in place. Fit abutting sections or ends of filler material tightly together to prevent concrete from entering expansion joint space. Place sealant in accordance with the manufacturer's written instructions.
5. Expansion Joints: Expansion joints shall have the dimensions and spacing shown, and be filled with preformed joint filler and sealant. Hold filler in place accurately and securely during placement and finishing of concrete. Use bonding adhesive to secure filler. Do not nail or stake filler in place. Under no circumstances shall concrete be left above expansion material or across the joint. Fit abutting sections or ends of filler material tightly together to prevent concrete from entering expansion joint space. Bulkheads, when used, shall have sufficient strength to remain straight form edge to edge of slab when concrete is placed against it.
6. Contraction Joints: Saw joints to dimensions indicated. Joint lines shall be within specified tolerances, straight, and extend for width of transverse joint and for entire length of longitudinal joint.

7. Construction Joints

    a. Butt Type Joints: Provide butt type joints as indicated by placing fresh concrete against hardened concrete. Clean vertical surface of hardened concrete and coat with curing compound or asphalt emulsion bond breaker before concrete is placed. After concrete has cured, saw joint as specified and in accordance with dimensions shown.
    b. Emergency Stops: If an emergency stop occurs remove the concrete back to the nearest transverse joint and install a keyed or doweled construction joint.
    c. Keyed Joints: Locate keyways as indicated. When concrete is placed using side or stationary forms, use plastic or metal forms securely fastened to the side forms to form the keyway. When concrete is placed using slip form pavers, form the keyway by metal forms permanently attached to the side forms or during slip form operation by inserting preformed metal or plastic keyway liner which by be left in place.

8. Preparation of Joints

    a. General: Seal joints unless otherwise indicated. Immediately before installation of sealant, thoroughly clean joints until, laitance, curing compound, preformed joint filler, and protrusions of hardened concrete are removed from sides and upper edges of joint space.

b. Cleaning of Sawed Joints: Use a power-driven concrete saw to saw through preformed joint filler and to widen joint to indicated dimensions. Blow loosened materials from the joint with compressed air. Clean concrete joint faces and pavement joint surfaces extending at least one inch from the edges of joints by thoroughly sandblasting and air blowing until the surfaces are free of dust, dirt, curing compound, preformed joint filler, and other material that might prevent bonding of sealer to concrete.

9. Installation

a. Blocking Media: Immediately after joints receive final cleaning, install blocking media specified in the bottom of the joint reservoir.
b. Liquid Sealants: Install liquid sealants in accordance with the manufacturer's written instructions. Fill joints to the depths and tolerances indicated without formation of voids or entrapped air. Remove excess or spilled sealant from pavement and discard.
c. Preformed Compression Seals: Install preformed compression seals in accordance with the manufacturer's written instructions. Size preformed compression seals appropriately for the joint being sealed as recommended by the manufacturer.

3.7 CURING

A. General: Protect concrete adequately from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, oil stains and other deleterious actions. Do not allow newly placed pavement to dry out from the time it is placed until the expiration of the specified curing period. Use impervious sheeting curing or liquid membrane forming compound curing. Do not use membrane forming compound curing where surface is to be painted, where coverings are to bonded, where other concrete is to be bonded. Maintain temperature of air next to concrete above 40°F for duration of curing.

B. Impervious Sheeting Curing: Wet entire exposed surface thoroughly with a fine spray of water and then cover with impervious sheeting. Lay sheets directly on concrete surface and overlap 12 inches. Make sheeting not less than 18 inches wider than the surface being cured. Weigh down edges and overlaps to form closed joints. Repair or replace sheets when torn or otherwise damaged during curing. Leave sheeting on concrete surface to be cured for at least 7 days.

C. Liquid Membrane Forming Compound Curing

1. Seal or cover joint openings prior to application of curing compound to prevent curing compound from entering the joints. Compound shall remain on concrete for 7 days before removing sealer or covering, and placing sealing material in joints.
2. Apply compound immediately after surface loses its water sheen and has a dull appearance and before joints are sawed. Apply in strict accordance with manufacturer's written instruction. Apply an additional coat of compound immediately to areas where film is defective. Reapply to areas that are subject to heavy rainfall within 3 hours after curing compound has been applied in the same area.
3. Keep concrete surfaces to which liquid membrane forming compound have been applied free from vehicular traffic and other sources of abrasion for not less than 72 hours. Except for joint sawing operations, foot traffic is restricted until after 24 hours for inspection purposes. Maintain continuity of coating for the entire curing period and repair damage to coating immediately.

3.8 PROTECTION

A. Protect new portland cement concrete pavement from damage for the duration of the contract.

B. Existing Pavement: Protect existing pavements to remain from damage. Movement of construction machinery and equipment over existing pavements during construction shall be at the Contractor's risk. Existing pavements

damaged by the contractor's operations shall be repaired or replaced to their original condition at the contractor's expense.

C. Erosion Control: Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the contract drawings.

D. Existing Utilities: Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall contact the local utility location company or each applicable utility company as required for assistance in locating existing utilities.

E. Structures and surfaces: Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance.

3.9 INSPECTION AND TESTING

A. Inspections

1. Notify the Owner, Project Representative and Engineer a minimum of 72 hours prior to all required observations, inspections or tests.
2. All work conducted and materials furnished shall be subject to review by the Engineer or the Project Representative. The Engineer will also have the right to require that any portion of the work be conducted in his presence.

    a. If the work is covered after such instruction, it shall be exposed by the Contractor for observation.
    b. However, if the Engineer is notified that such work is scheduled and the Engineer fails to appear within 72 hours, the Contractor may proceed without him.

3. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon written notice.

    a. The Engineer shall have the right to mark materials as rejected to distinguish them as such.

B. Testing

1. All testing shall be made at the Owner's expense. The Engineer shall approve test locations.
2. Notify the testing laboratory, Engineer and Owner a minimum of 72 hours prior to all tests.
3. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.

4. Laboratory Testing

    a. Independent Testing Laboratory shall operate in accordance with ASTM E-329 (latest revision) and shall be approved by the Engineer prior to engagement.
    b. Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test. Agencies to be used shall be submitted to the Engineer for review prior to engagement.

    c. Aggregate Base:

        1) Maximum density and optimum moisture: ASTM D1557 for general soil types or ASTM D4253 or ASTM D4254 for isolated cohesionless materials.

2) Frequency of laboratory testing: One maximum density and optimum moisture content test for each source.

5. Field Testing

a. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results.
b. If any test performed fails to meet these specifications, Independent Testing Laboratory shall immediately notify the Owner, Engineer and Contractor.
c. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary. The Contractor shall provide free access to the site for testing activities.

d. Field tests for in-place aggregate base materials shall be performed as follows:

1) In-place density in accordance with one of the following:

a) Sand Cone Method: ASTM D1556
b) Balloon Method: ASTM D2167
c) Nuclear Method: ASTM D2922

2) Grade
3) Straightedge

e. Field test for portland cement concrete pavement shall be performed as follows:

1) Slump Tests: ASTM C143.
2) Compressive Tests: ASTM C39.
3) Air Content Tests - ASTM C231.
4) Surface Tests: After curing, test the entire pavement surface with a 10 foot straight edge. Remove and replace concrete, mechanically grind or profile concrete surface, or correct surface as approved, for any portion of the pavement which shows irregularities greater than 0.25 inches in 10 feet in a longitudinal and transverse direction.
5) Thickness Tests: Measure during placement to determine in place thickness of concrete pavement.
6) Reinforcement: Inspect reinforcement prior to installation to assure it is free of loose flaky rust, loose scale, oil, mud, or other objectionable material.
7) Dowels: Inspect dowel placement prior to placing concrete to assure that dowels are of the size indicated, and are spaced, aligned, painted, and oiled as specified. Dowels shall not deviate from vertical or horizontal alignment after concrete placement by more than 0.125 inch per foot.

f. Frequency of field testing

1) Aggregate Base Course:

a) In place density: 1 per 1000 SY per lift.
b) Grade: Entire site (50 feet grid maximum).
c) Straightedge: Entire site (25 feet grid maximum).

2) Portland Cement Concrete Pavement:

a) Slump Tests: Take samples for slump determination from concrete during placement. Perform tests at the beginning of a concrete placement operation and at subsequent intervals to ensure that specification requirements are met. In addition, perform tests each time test cylinders are made.

b) Compressive Tests: Make four test cylinders for each set of tests. Test two cylinders at 7 days and two at 28 days. Concrete strength will be considered satisfactory when the minimum of the 28 day test results equals or exceeds the specified 28 day compressive strength and no individual strength test is less than 3,200 psi. If the ratio of the 7 day strength test to the specified 28 day strength is less than 65%, make necessary adjustments for conformance. Frequency of compressive tests on concrete cylinders shall not be less than four test cylinders for each 50 CY or fraction thereof, placed. Concrete which is determined to be defective based on strength acceptance criteria herein, shall be removed and replaced with acceptable concrete at the contractor's expense.

c) Air Content Tests: One sample taken during placement of concrete and at the same frequency as slump testing.

d) Surface Tests: Entire site (25 feet grid maximum).

3.10 ACCEPTANCE

A. If a tested material does not meet or exceed the specified requirements, the Contractor shall perform additional testing as directed by the Engineer to adequately define the limits of the material not meeting the specifications. Materials shall be re-tested to the satisfaction of the Engineer until specified requirements are met.

B. All additional testing and work that is the result of a failed test shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 321313

SECTION 321400 - UNIT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Concrete pavers.
2. Curbs and edge restraints.

B. Related Requirements:

1. Section 321313 "Concrete Paving" for cast-in-place concrete curbs and gutters serving as edge restraints for unit pavers.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data:

1. For materials other than water and aggregates.
2. For the following:

a. Pavers.
b. Edge restraints.

B. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C136.

C. Samples for Initial Selection: For each type of unit paver indicated:

1. Joint materials involving color selection.
2. Exposed edge restraints involving color selection.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Adhesion and Compatibility Test Reports: From latex-additive manufacturer for mortar and grout containing latex additives.

C. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.

1. For solid interlocking paving units, include test data for freezing and thawing according to ASTM C67.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified unit paving installer. Installer's personnel assigned to the Work shall have Concrete Paver Installer Certification from the Interlocking Concrete Pavement Institute (ICPI) with one of the following designations:

1. Commercial Paver Technician Designation.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Submit to latex-additive manufacturer, for testing as indicated below, Samples of flooring materials that will contact or affect mortar and grout that contain latex additives.

1. Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimal adhesion with, and will be nonstaining to, installed brick and other materials constituting brick flooring installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store pavers 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.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquids in tightly closed containers protected from freezing.

E. Store asphalt cement and other bituminous materials in tightly closed containers.

1.9 FIELD CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 CONCRETE PAVERS

A. Concrete Pavers, Solid Interlocking Paving Units: Complying with ASTM C936/C936M and resistant to freezing and thawing when tested according to ASTM C67, made from normal-weight aggregates.

1. Lowcountry Pavers
2. Thickness: 2-3/8 inches.
3. Face Size and Shape:

    a. Plantation Paver.

4. Color: Battery Gray

2.3 CURBS AND EDGE RESTRAINTS

A. Steel Edge Restraints: Manufacturer's standard painted steel edging 1/4 inch (6.4 mm) thick by 5 inches (125 mm) high with loops pressed from or welded to face to receive stakes at 36 inches (900 mm) o.c. and steel stakes 15 inches (380 mm) long for each loop.

B. Job-Built Concrete Edge Restraints: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mixed concrete with minimum 28-day compressive strength of 3000 psi (20 MPa).

2.4 ACCESSORIES

A. Cork Joint Filler: Preformed strips complying with ASTM D1752, Type II.

B. Compressible Foam Filler: Preformed strips complying with ASTM D1056, Grade 2A1.

2.5 AGGREGATE SETTING-BED MATERIALS

A. Graded Aggregate for Subbase: Sound, crushed stone or gravel complying with ASTM D448 for Size No. 57 requirements in Section 312000 "Earth Moving" for subbase material.

B. Graded Aggregate for Base: Sound, crushed stone or gravel complying with ASTM D448 for Size No. 8 requirements in Section 312000 "Earth Moving" for base course.

C. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C33/C33M for fine aggregate.

D. Stone Screenings for Leveling Course: Sound stone screenings complying with ASTM D448 for Size No. 10.

E. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.

1. Provide sand of color needed to produce required joint color.

F. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications; made from polyolefins or polyesters, with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2, AASHTO M 288.

2. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D4751.
3. Permittivity: 0.02 per second, minimum; ASTM D4491.
4. UV Stability: 50 percent after 500 hours' exposure, ASTM D4355.

G. Drainage Geotextile: Nonwoven needle-punched geotextile fabric, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2, AASHTO M 288.
2. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D4751.
3. Permittivity: 0.5 per second, minimum; ASTM D4491.
4. UV Stability: 50 percent after 500 hours' exposure, ASTM D4355.

H. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Where unit paving is to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations, including areas where waterproofing system is turned up or flashed against vertical surfaces.

3.2 PREPARATION

A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.

C. Proof-roll prepared subgrade according to requirements in Section 312000 "Earth Moving" to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for unit pavers.

3.3 INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

1. For concrete pavers, a block splitter may be used.

D. Handle protective-coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.

E. Joint Pattern: Herringbone, As indicated.

F. Tolerances:

1. Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage) or 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.
2. Do not exceed 1/16-inch (1.6-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches (3 mm in 600 mm) and 1/4 inch in 10 feet (6 mm in 3 m) from level, or indicated slope, for finished surface of paving.

G. Expansion and Control Joints:

1. Provide for sealant-filled joints at locations and of widths indicated. Provide compressible foam filler as backing for sealant-filled joints unless otherwise indicated; where unfilled joints are indicated, provide temporary filler until paver installation is complete. Install joint filler before setting pavers. Sealant materials and installation are specified in Section 079200 "Joint Sealants."
2. Provide cork joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.

H. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.
2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch (25 mm) below top edge.
3. Install job-built concrete edge restraints to comply with requirements in Section 033000 "Cast-in-Place Concrete."
4. Where pavers set in mortar bed are indicated as edge restraints for pavers set in aggregate setting bed, install pavers set in mortar and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.
5. Where pavers embedded in concrete are indicated as edge restraints for pavers set in aggregate setting bed, install pavers embedded in concrete and allow concrete to cure before placing aggregate setting bed and remainder of pavers. Hold top of concrete below aggregate setting bed.

I. Provide steps made of pavers as indicated. Install paver steps before installing adjacent pavers.

1. Where pavers set in mortar bed are indicated for steps constructed adjacent to pavers set in aggregate setting bed, install steps and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.

3.4 AGGREGATE SETTING-BED APPLICATIONS

A. Compact soil subgrade uniformly to at least 95 percent of ASTM D698 laboratory density.

B. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Place separation geotextile over prepared subgrade, overlapping ends and edges at least 12 inches (300 mm).

D. Place aggregate subbase and base, compact by tamping with plate vibrator, and screed to depth indicated.

E. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches (300 mm).

F. Place leveling course and screed to a thickness of 1 to 1-1/2 inches (25 to 38 mm), taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.

G. Treat leveling course with herbicide to inhibit growth of grass and weeds.

H. Set pavers with a minimum joint width of 1/16 inch (1.5 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.

1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.

I. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.

1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches (900 mm) of uncompacted pavers adjacent to temporary edges.
2. Before ending each day's work, compact installed concrete pavers except for 36-inch (900-mm) width of uncompacted pavers adjacent to temporary edges (laying faces).
3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches (90 mm) of laying face.
4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.

J. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

K. Do not allow traffic on installed pavers until sand has been vibrated into joints.

L. Repeat joint-filling process 30 days later.

3.5 REPAIRING, POINTING, AND CLEANING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.

END OF SECTION 321400

SECTION 321613 - SITE WORK CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers all materials, labor and equipment for portland cement concrete used in structures, sidewalks, curb and gutter.

1.2 SUBMITTALS

A. Mix Designs: The Contractor shall submit for review a design mix for each class of concrete proposed for use. The mix shall be prepared by an approved testing laboratory. Compressive strength of at least four (4) test specimens of the design mix shall indicate 15% higher than 28 days strength specified.

B. Field Testing: Compressive strength tests

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

1.4 REGULATORY REQUIREMENTS

A. Comply with all federal, state and local regulatory requirements.

1.5 CRITERIA FOR BIDDING

A. Lump Sum Price

1. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which is it associated and shall be included in the lump sum price. The price shall be full compensation for the material, compaction, shaping, finishing, dressing, disposal of surplus material, testing construction supervision and all other work required for satisfactory completion of the portland cement concrete.

B. Unit Prices

1. None this Section.

1.6 QUALITY ASSURANCE

A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.

B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.

C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.

D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.

E. Environmental Conditions: Concrete shall be mixed and placed only when temperature is at least 40 degrees F and rising.

F. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 CONCRETE

A. Design Mix in accordance with ACI 211.1.

Class	Compressive Strength (28 day)	Application
A	3,000 psi	Curb and gutters, sidewalks, structures
B	2,500 psi	Thrust blocks

1. Cement: ATM C 150, Type I
2. Water: Shall be clean, fresh and potable.
3. Aggregates: ASTM C 33
4. Admixtures: Where not shown or specified, the use of admixtures is subject to the written approval of the Engineer.
   a. Air Entraining: ASTM C 260, Use in all portland cement concrete pavement.
   b. Retarding: ASTM C 494
   c. Accelerating: ASTM D 98
   d. Water Reducing: ASTM C 494
   e. Fly Ash and Pozzolans: ASTM C 618, Types N, F, or C
   f. Ground Iron Blast Furnace Slag: ASTM C 989, Grade 120

2.2 FORMS

A. Shall be wood, plywood, metal, or other qualified material and shall be of the grade or type suitable to obtain the finish specified. Forms shall be constructed to the shape, for line, and grade required, and shall be maintained sufficiently rigid to prevent deformation under load. Form work and details construction shall conform to Chapter 6 of ACI 318.

2.3 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615, Grade 60.

B. Mesh Reinforcement: ASTM A 1064, flat sheets.

2.4 JOINT MATERIALS

A. Blocking Media: Compressible, non-shrinkable, non-reactive with joint sealant and non-absorption type such as plastic rod, free of oils or bitumen's. Blocking media shall have a water absorption of not more than 5 percent by weight when tested in accordance with ASTM C 509. Blocking media shall be consistent with the joint sealant manufacturers installation instructions and be at least 25 percent larger in diameter than the width of the joint being sealed.

B. Preformed Joint Filler: ASTM D 1751 or ASTM D 1752 Type II or III. Filler must be compatible with sealant. filler

C. Liquid Joint Sealant: Silicone joint sealant such as Dow Corning 890SL or approved equal.

D. CURING MATERIALS

1. Impervious Sheeting: ASTM C 171 with minimum sheet thickness of 10 mils. Non-reactive with other materials such as curing compound.
2. Liquid Membrane-Forming Compound: ASTM C 309, white pigmented, Type 2, Class B, free of paraffin or petroleum

2.5 ANCHORAGE ITEMS

A. Slots, inserts, clips, and other devices for anchoring masonry, wood, steel, and mechanical items to concrete shall be of standard manufacture, and of qualified types as required to engage and anchor the work specified under other sections.

PART 3 - EXECUTION

3.1 ON SITE OBSERVATION OF WORK

A. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 48 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or Project Representative and improper work shall be reconstructed, and all materials, which do not conform to the requirements of the specifications, shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.

B. The Contractor shall give the Project Engineer or Project Representative a minimum of 48 hours' notice for all required observations or tests.

3.2 PREPARATION BEFORE PLACING

A. Water shall be removed from excavations before concrete is deposited. Hardened concrete debris, and other foreign materials shall be removed from the interior of forms and from the inside of mixing and conveying equipment. The reinforcement shall be made secure in position and shall be subject to examination and approval.

B. Prepare surface to receive concrete in accordance with SECTION "EARTH MOVING".

3.3 FORMS

A. Construct forms to be removable without damaging the concrete.

B. Coating: Before placing the concrete, coat the contact surfaces of forms, (except existing pavement sections where bonding is required) with a non-staining mineral oil, non-staining form coating compound, or two coats of nitro-cellulose lacquer. When using existing pavement as a form, clean existing concrete and then coat with an asphalt emulsion bond breaker before concrete is placed.

C. Grade and Alignment: Check and correct grade elevations and alignment of the forms immediately before placing the concrete.

3.4 REINFORCEMENT

A. Metal reinforcement shall be free from rust, scale or other coatings, and shall be accurately placed and properly secured in position by concrete blocks or metal chairs and by spacers. Bars shall be bent cold. Exposed bars intended for bonding with fixture extensions shall be protected from corrosion by an accepted covering. Bar chairs shall be hot dipped galvanized where in contact with forms for concrete that is exposed to view.

1. Concrete Protection over Steel Reinforcement: Concrete deposited against ground: 3 inches. Formed surfaces exposed to weather or ground: 2 inches for bars #6 and larger, 1-1/2 inch for bars less than #6. Interior surfaces, beams, girders, and columns: 1-1/2 inch. Slabs, walls, and joists: ¾ inch for bars #11 and smaller.

3.5 MEASURING, MIXING, CONVEYING, AND PLACEMENT CONCRETE

A. Measuring, mixing and conveying: ASTM C 94.

B. Concrete mixed at the job site shall be mixed in a batch mixer in accordance with ACI 318 and in a similar manner subject to approval. Mixing time for stationary mixers over 1 cubic yard in capacity shall be increased 15 seconds for each additional ½ cubic yard or fraction thereof of material mixed.

3.6 PLACING CONCRETE

A. Placing of concrete shall conform to Chapter 5 of ACI 318. Concrete having attained initial set or having contained water for more than 90 minutes shall not be used in the work. Concrete shall not be dropped freely more than five feet on unexposed work, or more than three feet in exposed work. Concrete shall be mixed and placed only when temperature is at least 40 degrees F and rising. Concrete footings shall be placed only upon surfaces that are free from frost, ice, mud, or other detrimental circumstances. When placed on dry soil or pervious material, water proof paper or polyethylene sheeting shall be laid over the surfaces that are to receive the concrete.

3.7 FINISHES

A. Concrete shall be deposited to the required thickness, compacted, screed to grade, and finished monolithically to a smooth broom finish. Where drains, or sumps occur, the concrete shall be sloped to drain. Slight honeycomb and minor defects shall be patched with cement mortar made with one-part cement and two parts fine aggregate and then rubbed smooth with carborundum brick. Patching shall be accomplished immediately after forms are removed. Immediately after removing forms, other exposed surfaces shall be dampened, brush-coated with grout, and rubbed with a wood float. Floating devices shall be rubbed with burlap and kept damp by fog spraying.

3.8 CURING

A. Immediately after placing or finishing, concrete surfaces not covered by forms shall be protected against moisture loss for not less than 7 days by use of impervious sheeting or curing compound. Curing compound shall be applied in strict accordance with the manufacturer's recommendations.

3.9 BONDING AND GROUTING

A. Before depositing new concrete on concrete that has set, the surface of the set concrete shall be thoroughly cleaned of laitance, foreign matter, and loose particles leaving a rough surface with clean and sound exposed aggregate. Forms shall be retightened, and the surfaces of the set concrete shall be slushed with a grout coat of neat cement and water. Where an epoxy bonding agent is called for on the drawings, the epoxy bonding agent shall be polysulfide liquid polymer and an epoxy resin combined at the job site, in equal volumes and thoroughly mixed. The mixed agent shall be applied on a clean concrete surface by brushing or spraying. A 10-mil coating shall be spread evenly to cover all bonding surfaces. When a bonding agent has been applied, and while the surface is still sticky, new concrete to be bonded shall be put in place.

3.10 PROTECTION

A. Protect new portland cement concrete from damage for the duration of this contract.

B. Existing Pavement: Protect existing pavements to remain from damage. Movement of construction machinery and equipment over existing pavements during construction shall be at the Contractor's risk. Existing pavements damaged by the contractor's operations shall repaired or replaced to their original condition at the contractor's expense.

C. Erosion Control: Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the contract drawings.

D. Existing Utilities: Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall contact the local utility location company or each applicable utility company as required for assistance in locating existing utilities.

E. Structures and surfaces: Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance.

3.11 INSPECTION

A. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.

B. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours' notice for all required observations or tests.

3.12 TESTING

A. General

1. Owner will engage a qualified testing agency to perform tests and inspections.

    a. Test locations shall be approved by the Engineer.

2. Testing Agencies: Testing shall be done by a testing laboratory which operates in accordance with ASTM E 329 (latest revision) and approved by the Engineer prior to engagement.

    a. Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test.
    b. Agencies to be used shall be submitted to the Engineer for review prior to engagement.

3. The testing laboratory, Engineer and Owner shall be given a minimum of 72-hour notice for all tests.
4. Test results and reports shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.

B. Field Testing

1. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results.
2. In the event that any test performed fails to meet these specifications, the Owner, Engineer and Contractor shall be notified immediately by Independent Testing Laboratory. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary. The Contractor shall provide free access to the site for testing activities.

3. Field test for concrete shall be performed as follows:

    a. Compressive strength test: ASTM C 39
    b. Grade

4. Frequency of field testing

    a. Compressive Strength: Three (3) test cylinders for each 50 cubic yards of concrete placed, or for each structure requiring more than 10 cubic yards of concrete. One cylinder shall be tested at 7 days and two at 28 days in accordance with ASTM C 39.
    b. Grade: Check each structure, sidewalk or other feature for proper grade, slope and cross slope.

C. Acceptance

1. In the event that a tested material does not meet or exceed the specified requirements, the Contractor shall perform additional testing as directed by the Engineer to adequately define the limits of the material not meeting the specifications. Materials shall be re-tested to the satisfaction of the Engineer until specified requirements are met.
2. All additional testing and work, which is the result of a failed test, shall be [[performed][paid for] by the Contractor at no additional cost to the Owner].

END OF SECTION 321613

SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, equipment and services for pavement markings of types, patterns, sizes and colors as shown on the plans and as specified herein:

1.2 SUBMITTALS

A. Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for the following:

1. Paints
2. Reflective media
3. Thermoplastic Material

B. Deliver paints and paint materials in original sealed containers that plainly show the designated name, specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer. Provide storage facilities at the job site for maintaining materials at temperatures recommended by the manufacturer.

1.3 REGULATORY REQUIREMENTS

A. Comply with federal, state, and local regulations.

1.4 CRITERIA FOR BIDDING

A. Lump Sum Bid

1. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which is it associated and shall be included in the lump sum price. The price shall be full compensation for all material, equipment, labor, testing, construction supervision and all other work required for satisfactory completion of pavement marking.

B. Unit Prices

1. None this Section.

1.5 QUALITY ASSURANCE

A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.

B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.

C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.

D. Environmental Conditions: Unless otherwise approved by the manufacturer's written instructions, apply paint to clean, dry surfaces, and unless otherwise approved, only when air and pavement temperatures are above 5 degrees C 40 degrees F for oil-based materials, 50 degrees F for water-based materials, and less than 95 degrees F. Maintain paint temperature within these same limits.

E. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paints: Federal Specification TT-P-1952, color as indicated.

B. Reflective Media: Federal Specification TT-B-1325, Type I, Gradation A.

C. Thermoplastic Materials: Install in accordance with South Carolina Department of Transportation Specifications.

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACE

A. Prepare surface in accordance with manufacturer's written instructions.

B. Allow new pavement surfaces to cure as recommended by the manufactures written instructions or 30 days if not specified by the manufacturer.

C. Except as otherwise specified by the manufacturer's written instructions:

D. Thoroughly clean surfaces to be marked before application of the paint. Remove dust, dirt, residual curing compounds and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, water blasting or a combination of these methods as required. Scrub affected areas, where oil or grease is present on old pavements to be marked, with several applications of trisodium phosphate solution or other approved detergent or degreaser and rinse thoroughly after each application. After cleaning oil-soaked areas, seal with shellac or primer recommended by the manufacturer to prevent bleeding through the new paint. Do not commence painting in any area until pavement surfaces are dry and clean

3.2 APPPLICATION

A. Rate of Application

1. Paint: Apply paint evenly to the pavement area to be coated at a rate of 105 plus or minus 5 square feet per gallon.
2. Reflective media: Apply glass spheres uniformly to the wet paint on road and street pavement at a rate 6 plus or minus (0.5) pounds of glass spheres per gallon.

B. Painting: Provide guidelines and templates as necessary to control paint application. Take special precautions in marking numbers, letters, and symbols. Manually paint numbers, letters, and symbols. Sharply outline all edges of markings. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. Discontinue painting operations if there is a deficiency in drying of the markings until cause of the slow drying is determined and corrected.

C. Reflective Media: Application of reflective media shall immediately follow the application of paint. Accomplish drop-on application of the glass spheres to ensure even distribution at the specified rate of coverage. Should there be a malfunction of either paint applicator or reflective media dispenser, discontinue operations until deficiency is corrected.

D. Curing: Allow markings to cure in accordance with manufacturer's written instructions.

3.3 PROTECTION

A. Protect new markings from adverse weather and traffic as recommended by the manufacturer's written instructions.

B. As required, place warning signs near the beginning of the work site and well ahead of the work site for alerting approaching traffic from both directions. Place small markers along newly painted lines to control traffic and prevent damage to newly painted surfaces. Mark painting equipment with large warning signs indicating slow-moving painting equipment in operation.

3.4 INSPECTIONS

A. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work completed, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.

B. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours notices for all required observations or tests.

3.5 ACCEPTANCE

A. Final acceptance will be based on satisfactory construction of markings as approved by the Engineer. Markings shall be re-worked to the satisfaction of the Engineer until specified requirements are met.

B. All additional work, which is the result of failed inspections, shall be paid for by the Contractor at no additional cost to the Owner.

END OF SECTION 321723

SECTION 321823.53 – COURT SURFACING

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 types of playground surface systems and accessories:

1. Acrylic Court Surface Systems

B. Related Sections include the following:

1. Division 32 Section "Asphalt Paving" for pavement substrate for acrylic surfaces.

1.3 SUBMITTALS

A. Product Data: Manufacturer's technical data and material safety data sheets for materials.

B. Shop Drawings: For acrylic court surface system, include materials, cross sections, drainage, installation, and edge termination.

C. Installer qualification data: Submit list of previous projects with names of Owner, Architect or Landscape Architect, description and date of work performed.

D. Product Test Reports: From a qualified testing agency indicating acrylic court surface system complies with requirements, based on comprehensive testing of current products.

E. Maintenance Data: For acrylic court surface system to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An installer with a minimum of five years' experience in the application of athletic surface systems similar in material, design, and extent to that indicated for this Project and whose work has resulted in installations with a record of successful in-service performance.

B. Standards and Guidelines: Provide court surface systems complying with applicable provisions of the following, unless more stringent provisions are indicated:

1. Certified Tennis Court Builder.

2. Member of the American Sports Builder Association.

1.5 WARRANTY

A. The installer shall warrant completed courts against faulty workmanship and/or materials for a period of two (2) years from date of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver manufactured materials in original packages with seals unbroken and bearing manufacturer's labels indicating brand name and directions for storing.

B. Store materials in a clean, dry location, protected from weather and deterioration, and complying with manufacturer's written instructions for minimum and maximum temperature requirements for storage.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit the surface system to be performed according to manufacturer's written instructions or warranty requirements.

1.8 COORDINATION

A. Coordinate application of acrylic court surface system with installation of post, nets, fences and gates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Laykold Surfacing: Advanced Polymer Technology, Tel: 732.206-0031
2. Or approved equal.

2.2 ACRYLIC COURT SURFACE SYSTEM

A. Leveling Material: Sand filled asphalt emulsion or acrylic emulsion, as approved by the manufacturer of the acrylic surface system.

B. Filler material: 100 percent acrylic emulsion, formulated with acrylic resins, mineral fillers, color fast pigments and silica sand; UV protected.

C. Finish coats: 2 layers of 100 percent acrylic emulsion, formulated with acrylic resins, mineral fillers, color fast pigments and silica sand; two colors as indicated.

2.3 PAINT

A. Provide textured acrylic paint manufactured or approved by manufacturer of acrylic court surface system for use with the acrylic court surface formulation applied on this project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing courts for condition of substrate.

B. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for subgrade and substrate conditions, for compliance with USTC&TBA Guidelines and system manufacturer's requirements, and for other conditions affecting performance.

1. Clean, dry: free of grease, oil, dust or dirt.
2. Surface temperature above 50 and below 140 degrees F.
3. Sloped to drain at percent shown on drawings.
4. Tolerance: surface shall not vary more than 1/4-inch in 10 feet from required grade.
5. Thoroughly cured: a minimum of 14 days for new asphalt.

C. Test substrate for ponding water:

1. Flood court with water and allow to drain for one hour at 70 degrees F.
2. Mark “Birdbaths” of any size larger than a 5-cent coin.
3. Patch and level “birdbaths” in accordance with recommendations of the manufacturer of the acrylic court finish system.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION, ACRYLIC COURT SURFACE SYSTEM

A. Based on pavement conditions, porosity and texture and conditions of patches, if any, apply an acrylic or asphalt emulsion resurfacer to provide a smooth, dense, uniform texture for subsequent acrylic color coating.

3.3 INSTALLATION, ACRYLIC COURT SURFACE SYSTEM

A. Protect adjacent construction, paving and landscaping from damage during installation of acrylic court surfaces.

B. General: Comply with acrylic court surface system manufacturer's written installation instructions.

C. Apply one coat of acrylic emulsion filler (resurfacing) material to depth recommended by manufacturer. Allow to dry; inspect and repair defects. Sweep or blow clean.

D. Apply two coats of acrylic emulsion finish material to depth recommended by manufacturer. Apply each layer at 90 degrees to the previous coat. Apply colors as indicated.

E. Paint playing lines for tennis in accordance with requirements of USTA.

3.4 PROTECTION

A. Protect newly graded areas from all types of traffic, both foot and motorized, for at least 48 hours after surface has thoroughly dried.

B. Repair or replace surfaces, landscaping or adjacent construction damaged during installation to satisfaction of Architect.

END OF SECTION 321823.53

SECTION 323300 - SITE FURNISHINGS

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. Guard Booth.
2. Outdoor Shower.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing pipe sleeves cast, installing anchor bolts cast, formed voids in concrete footings.
2. Section 312000 "Earth Moving" for excavation for installing concrete footings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For site furnishings manufactured with preservative-treated wood.

1. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 GUARD BOOTH

A. 6’x8’ Guard Booth – Verona A, product #68GHVA, by Twin Modular Services, Inc., guardboothonline.com, 856-227-0057.

B. Upgrades / Options

1. Sliding Door – Top suspended on 8’ wide side (right drive-aisle side).

2. Data Junction Box.

3. Additional wall receptacles.

4. GFCI 120v receptacle – exterior

5. Under counter storage draw.

6. Engineered drawings – PE sealed.

2.2 OUTDOOR SHOWER

A. Shower Tower, Inc., 800-330-9073, www.showertower.com.

1. Three (3) shower heads at stations 1, 3, and 5.

2. One (1) foot wash at station 2.

3. One (1) hose bib at station 4.

4. ADA compliant control valves.

5. Color: Gray.

2.3 BOLLARDS

A. Dumor

1. Removeable bollards #400-36/S-1sl.
2. Color: Black

B. Install per manufacturers specifications.

C. Bollard Construction:

2.4 MATERIALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:

1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Structural Pipe and Tube: ASTM B 429/B 429M.
4. Sheet and Plate: ASTM B 209 (ASTM B 209M).
5. Castings: ASTM B 26/B 26M.

B. Anchors, Fasteners, Fittings, and Hardware: Stainless steel or Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality, tamperproof, vandal and theft resistant.

C. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M; recommended in writing by manufacturer, for exterior applications.

D. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.

2.5 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

E. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.6 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. Clean holes of loose material insert posts and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

END OF SECTION 323300

SECTION 328473 - PLANTING IRRIGATION (PERFORMANCE)

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. Extent of landscape irrigation system is shown on drawings. Coordinate water meter and backflow location with civil engineer and City/County requirements. Irrigation shall be metered separately from water supply to building. All fees shall be included in cost of system.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's technical data and installation instructions for underground planting irrigation system.

B. Shop Drawings:

1. Include plan layout and details. Indicate location and type of heads, valves, piping circuits, controls, pump, pump housing, suction line, inlet filtration device, and accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

A. Record Drawings: Submit three copies of record (as-built) drawings to Owner identifying actual installation locations and materials.

B. Operation and Maintenance Data: For planting irrigation system to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Provide underground planting irrigation system as a complete unit, produced by a single manufacturer, including heads, valves, piping circuits, controls, and accessories. Include plan layout and details. Indicate location and type of heads, valves, piping circuits, controls, pump, pump housing, suction line, inlet filtration device, and accessories.

1.8 WARRANTY

A. Warranty: Installer agrees to repair or replace components of planting irrigation system that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Rainbird
2. Hunter
3. Toro

2.2 PERFORMANCE REQUIREMENTS

A. Planting Irrigation Design Layout may be modified, if necessary to obtain coverage, to suit manufacturer's standard heads. Do not decrease the number of heads indicated unless otherwise acceptable to Landscape Architect.

B. Minimum Water Coverage

1. Turf areas - 95% (Sprinkler heads)
2. Other planting areas - 90% (Dripline)

2.3 COMPONENTS

A. Pressure Pipe: PVC plastic pipe, ANSI/ASTM D 1785, Schedule 40.

B. Pipe Fittings: PVC plastic pipe socket fittings, ANSI/ASTM D 2466 with ASTM D 2564 solvent cement.

C. Valves: Manufacturer's standard of type and size indicated, and as follows:

1. Automatic Circuit Valves operated by low-power solenoid normally closed, manual flow adjustment.

D. Sprinkler Heads: Manufacturer's standard unit designed to provide uniform coverage over entire area of spray as shown on drawings at available water pressure.

E. Dripline: Manufacturer’s standard dripline designed to provide uniform coverage over entire area of plant beds shown on drawings at available water pressure.

F. Valve Box: Rigid plastic, green or black in color.

2.4 AUTOMATIC CONTROL SYSTEM

A. Furnish low voltage system manufactured expressly for control of automatic circuit valves of underground sprinkler systems. Provide unit of capacity to suit number of circuits as indicated.

B. Interior Control Enclosure: Manufacturer's standard with locking cover, complying with NFPA 70.

C. Transformer: To convert building service voltage to control voltage as required.

D. Circuit Control

1. Each circuit variable from approximately 5 to 60 minutes.
2. Include switch for manual or automatic operation of each circuit.

E. Timing Device

1. Adjustable, 24-hour and 7 or 14-day clocks to operate any time of day and skip any day in a 7 or 14-day period.
2. Allow for manual or semi-automatic operation without disturbing preset automatic operation.

F. Rain Gauge: To provide automatic interruption of watering cycle when rainfall exceeds a pre-selected amount.

PART 3 - EXECUTION

3.1 TRENCHING AND BACKFILLING

A. Excavate straight and true with bottom uniformly sloped to low points. Protect existing lawns and plantings. Remove and replant as necessary to complete installation.

B. Replace damaged lawn areas with new to match existing.

C. Excavate trenches to a depth of 3 inches below invert of pipe, unless otherwise indicated.

D. Provide 12 inches minimum cover over PVC pipe.

E. Backfill trenches with clean material from excavation. Remove organic material as well as rocks and debris larger than 1inch in diameter.

F. Where trenching is required across existing lawns, uniformly cut strips of sod 6 inches wider than trench. Remove sod in rolls of suitable size for handling and keep moistened until replanted.

G. Backfill trench to within 6 inches of finished grade. Continue fill with acceptable topsoil and compact to bring replaced sod even with existing lawn.

H. Replant sod within 7 days after removal, roll and water generously.

I. Install 4-inch PVC pipe under proposed structures where shown on plan, prior to construction of those structures, for use as a chase for irrigation pressure pipe and wiring.

J. Jack or wash piping under existing structures where necessary. Where existing pavements must be cut to install landscape irrigation system, cut smoothly to straight lines 6 inches wider than trench. Excavate trench to required depth and width.

K. Remove cut-out pavement and excavated material from the site. Backfill with dry sand fill material, placing in 6-inch lifts. Repair or replace pavement cuts with equivalent materials and finishes.

3.2 INSTALLATION

A. Unless otherwise indicated, comply with the requirements of the Uniform Plumbing code.

B. Maintain uninterrupted water service to building during normal working hours. Arrange for temporary water shut-off with Landscape Architect.

C. Install Circuit Valves in valve box and arranged for easy adjustment and removal. Provide union on downstream side. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.

D. Lay pipe on solid subbase, uniformly sloped without humps or depressions.

E. For circuit piping, slope to drain valve at least ½ inch in 10 feet of run.

F. At wall penetrations, pack the opening around pipe or wiring with non-shrink grout. At exterior face, leave a perimeter slot approximately ½ inch wide by ¾ inch deep. Fill this slot with backer grade waterproofing disturbed by this work and make penetration watertight.

G. Install PVC pipe in dry weather when temperature is above 40 degrees F in strict accordance with manufacturer's instructions. Allow joints to cure at least 24 hours above 40 degrees F before testing, unless otherwise recommended by manufacturer.

H. Restore any planting disturbed by this work.

I. Flush circuit lines with full head of water and install heads after hydrostatic test is completed. Install heads at manufacturer's recommended height or as indicated. Locate part-circle heads to maintain a minimum distance of 4 inches from walls and 2 inches from other boundaries.

3.3 FIELD QUALITY CONTROL

A. Perform operational testing and inspections after construction is completed, backfill is in place, and sprinkler heads adjusted to final positions.

1. Demonstrate that the system meets coverage requirements and that automatic controls function properly. Coverage requirements are based on operation of one circuit at a time.

B. The Landscape Architect shall observe all testing and shall be notified, in writing, 72 hours in advance of testing.

C. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

D. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

E. Prepare test and inspection reports.

END OF SECTION 328473

SECTION 329200 - TURF AND GRASSES

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. Seeding.
2. Hydroseeding.
3. Sodding.
4. Turf renovation.
5. Erosion-control material(s).

B. Related Requirements:

1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, 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.

1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf[and meadows] during a calendar year. Submit before expiration of required maintenance periods.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:

    a. Landscape Industry Certified Technician - Exterior.
    b. Landscape Industry Certified Lawncare Manager.
    c. Landscape Industry Certified Lawncare Technician.

5. Pesticide Applicator: State licensed, commercial.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.8 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:

1. Quality: State-certified seed of grass species as listed below for solar exposure.
2. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
3. Species as shown on drawings.

2.2 TURFGRASS SOD

A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.

B. Turfgrass Species: As shown on drawings.

2.3 FERTILIZERS

A. 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 formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb./1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.4 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.

C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.

D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

E. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

F. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

G. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.5 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.6 EROSION-CONTROL MATERIALS

A. Erosion-Control 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. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb./sq. yd. (0.5 kg/sq. m), with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable, or which is dusty.

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

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydro mulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install 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.

3.3 TURF AREA PREPARATION

A. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.

1. Reduce elevation of planting soil to allow for soil thickness of sod.

B. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.

C. Fill cells of erosion-control mat with planting soil and compact before planting.

D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h).

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 3 to 4 lb./1000 sq. ft. (1.4 to 1.8 kg/92.9 sq. m).

C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:2 with erosion-control blankets installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.

F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
2. Bond straw mulch by spraying with asphalt emulsion at a rate of 10 to 13 gal./1000 sq. ft. (38 to 49 L/92.9 sq. m). Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

G. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch (4.8 mm) and roll surface smooth.

3.6 HYDROSEEDING

A. Hydroseeding: Mix specified seed, commercial fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with non-asphaltic or fiber-mulch manufacturer's recommended tackifier.
2. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre (15.6-kg/92.9 sq. m) dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
3. Spray-apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre (5.2-kg/92.9 sq. m) dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydro mulching) at a rate of 1000 lb./acre (10.4 kg/92.9 sq. m).

3.7 SODDING

A. Lay sod within 24 hours of harvesting unless a suitable preservation method is accepted by Architect prior to delivery time. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across slopes exceeding 1:3.
2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.8 TURF RENOVATION

A. Renovate existing turf where indicated.

B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
2. Install new planting soil as required.

C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

E. Mow, dethatch, core aerate, and rake existing turf.

F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).

I. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.

1. Initial Fertilizer: Slow-release fertilizer applied according to manufacturer's recommendations.

J. Apply seed and protect with straw mulch as required for new turf.

K. Water newly planted areas and keep moist until new turf is established.

3.9 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow fescue to a height of 1-1/2 to 2 inches (38 to 50 mm).

D. Turf Postfertilization: Apply slow-release fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that provides actual nitrogen of at least 1 lb./1000 sq. ft. (0.45 kg/92.9 sq. m) to turf area.

3.10 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.11 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.12 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

3.13 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

1. Seeded Turf: 60 days from date of Substantial Completion.

    a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

2. Sodded Turf: 30 days from date of Substantial Completion.

END OF SECTION 329200

SECTION 329300 - PLANTS

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. Plants.
2. Tree stabilization.
3. Tree-watering devices.
4. Landscape edgings.

B. Related Requirements:

1. Section 015639 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.
3. Section 329600 "Transplanting" for transplanting non-nursery-grown trees.

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than sizes indicated; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than sizes indicated.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.

E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

G. Finish Grade: Elevation of finished surface of planting soil.

H. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

I. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

J. Planting Area: Areas to be planted.

K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

M. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

N. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

O. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 COORDINATION

A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

B. Samples for Verification: For each of the following:

1. Trees and Shrubs: Three Samples of each variety and size delivered to site for review. Maintain approved Samples on-site as a standard for comparison.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:

a. Landscape Industry Certified Technician - Exterior.
b. Landscape Industry Certified Horticultural Technician.

5. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1. Selection of plants purchased under allowances is made by Architect, who tags plants at their place of growth before they are prepared for transplanting.

C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

C. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

E. Handle planting stock by root ball.

F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.

G. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

H. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

I. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Installer 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, lack of adequate maintenance, or neglect by Owner.
b. Structural failures including plantings falling or blowing over.
c. Faulty performance of tree stabilization and edgings.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods: From date of Substantial Completion.

a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
b. Ground Covers, Biennials, Perennials, and Other Plants: 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 is 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.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots are unacceptable.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

2.2 FERTILIZERS

A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Size: 21-gram tablets.
2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.
2. Size Range: 3 inches (76 mm) maximum, 1/2-inch (13 mm) minimum.
3. Color: Natural.

B. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of the following type, size range, and color:

1. Type: Rounded riverbed rock or smooth-faced stone.
2. Size Range: 2”-5” inches.
3. Color: Readily available natural grey color range.

2.4 PESTICIDES

A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.5 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Wood Deadmen: Timbers measuring 8 inches (200 mm) in diameter and 48 inches (1200 mm) long, treated with specified wood pressure-preservative treatment.
2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.
3. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

2.6 LANDSCAPE EDGINGS

A. Steel Edging: Standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

1. Edging Size: 1/8 inch (3.2 mm) thick by 4 inches (100 mm) deep.
2. Stakes: Tapered steel, a minimum of 15 inches (380 mm) long.
3. Accessories: Standard tapered ends, corners, and splicers.
4. Finish: Manufacturer's standard paint.

    a. Paint Color: Black.

2.7 TREE-WATERING DEVICES

A. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents over two to three weeks; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.

1. Color: Green.

2.8 MISCELLANEOUS PRODUCTS

A. Wood Pressure-Preservative Treatment: AWPA U1, Use Category UC4a; acceptable to authorities having jurisdiction, and containing no arsenic or chromium.

B. Antidesiccant: 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 written instructions.

C. Burlap: Non-synthetic, biodegradable.

D. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.

E. Planter Filter Fabric: Woven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable, or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install 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.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

A. Placing Planting Soil: Place and mix planting soil in-place over exposed subgrade.

B. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
2. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.
3. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.

7. Maintain supervision of excavations during working hours.
8. Keep excavations covered or otherwise protected overnight.
9. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.

B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes, 24 inches (600 mm) apart, into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.

1. Backfill: Planting soil.
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.

    a. Quantity: Three for each caliper inch of plant.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Bare-Root Stock: Set and support each plant in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grade.

1. Backfill: Planting soil.
2. Spread roots without tangling or turning toward surface. Plumb before backfilling and maintain plumb while working.
3. Carefully work backfill in layers around roots by hand. Bring roots into close contact with the soil.
4. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

5. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside soil-covered roots about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole or touching the roots.

    a. Quantity: Three for each caliper inch of plant.

6. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.

C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

3.7 TREE STABILIZATION

A. Trunk Stabilization by Staking and Guying: Install trunk stabilization as follows unless otherwise indicated on Drawings. Stake and guy trees more than 14 feet (4.2 m) in height and more than 3 inches (75 mm) in caliper unless otherwise indicated.

1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys spaced equally around tree.

    a. Securely attach guys to stakes 30 inches (760 mm) long, driven to grade. Adjust spacing to avoid penetrating root balls or root masses. Provide turnbuckle for each guy wire and tighten securely.
    b. For trees more than 6 inches (150 mm) in caliper, anchor guys to wood deadmen buried at least 36 inches (900 mm) below grade. Provide turnbuckle for each guy wire and tighten securely.
    c. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
    d. Attach flags to each guy wire, 30 inches (760 mm) above finish grade.
    e. Paint turnbuckles with luminescent white paint.

3.8 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.

B. Use planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees and Treelike Shrubs in Turf Areas: Apply organic mineral mulch ring of 3-inch (75-mm) average thickness, with 36-inch (900-mm) radius around trunks or stems. Do not place mulch within 3 inches (75 mm) of trunks or stems.
2. Organic Mulch in Planting Areas: Apply 3-inch (75-mm) average thickness of organic over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches (75 mm) of trunks or stems.
3. Mineral Mulch in Planting Areas: Apply 3-inch (75-mm) average thickness of mineral over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches (75 mm) of trunks or stems.

3.10 EDGING INSTALLATION

A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches (760 mm) apart, driven below top elevation of edging.

B. Shovel-Cut Edging: Separate mulched areas from turf areas[, curbs, and paving] with a 45-degree, 4- to 6-inch-(100- to 150-mm-) deep, shovel-cut edge[as indicated on Drawings].

3.11 INSTALLING SLOW-RELEASE WATERING DEVICE

A. Provide one device for each tree.

B. Place device on top of the mulch at base of tree stem and fill with water according to manufacturer's written instructions.

3.12 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.13 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.14 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees that are more than 50 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree of 6 inches (150 mm) or smaller in caliper size.
2. Species of Replacement Trees: Same species being replaced.

3.15 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

END OF SECTION 329300

SECTION 331113 - POTABLE WATER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers all work associated with the furnishing and installation of all water mains, fire mains and service lines and their associated appurtenances to include backflow preventers, valves, hydrants, thrust restraints and thrust blocking.

1.2 PUBLIC UTILITY

A. The work shall be performed, installed, constructed, tested and approved in accordance with published specifications, standards, details and criteria of the Public Utility.

B. Public Utility that shall approve, operate and maintain the water supply system is:

1. City of Rock Hill

C. The Public Utility Specifications are hereby incorporated as part of this specification and are available from the Utility's website.

1.3 DEFINITION

A. Water distribution includes underground water-service piping and associated components outside the building.

B. Water-service piping conveys potable water to the building for domestic water distribution inside the building.

1.4 SUBMITTALS

A. Submit the following in accordance with the Conditions of Contract and Division 1 Specification Sections.

1. Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for each of the following to be used in this project:

a. Water Main Piping;
b. Water Service Piping;
c. Valves, backflow preventers, hydrants, valve boxes and other appurtenances

B. Operational Closeout Documentation: Provide documentation required by the Utility to place the system into operation. Items include but are not limited to:

1. Record Drawings as required by City of Rock Hill.
2. Guarantee / Warranty Documentation

1.5 PRECONSTRUCTION CONFERENCE

A. A Pre-Installation Meeting shall be held with the Utility prior to construction. The Contractor shall notify the Utility and Engineer a minimum of 72 hours in advance of the meeting.

PART 2 - PRODUCTS

2.1 PUBLIC UTILITY

A. All products shall be furnished, installed, tested and approved in accordance with published specifications, standards, details and criteria of the Public Utility.

PART 3 - EXECUTION

3.1 PUBLIC UTILITY

A. The work shall be performed, installed, constructed, tested and approved in accordance with published specifications, standards, details and criteria of the Public Utility.

3.2 RECORD DATA

A. The Contractor shall keep accurate, legible records of the location of all piping, valve, hydrants and backflow preventors. These records will be made available to the Engineer before his final review for incorporation into the Record Drawings. Final payment to the Contractor will be withheld until all such information is received and accepted.

3.3 INSPECTIONS

A. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours notices prior to all required inspections or tests.

B. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.

C. The Engineer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed properly in accordance with the drawings and specifications.

3.4 FIELD TESTING

A. Notification: The testing laboratory, Engineer and Owner shall be given a minimum of 72 hours notice prior to all tests.

B. Complete field testing as required by City of Rock Hill.

3.5 ACCEPTANCE

A. Final acceptance will be based on satisfactory materials, installation and construction of the specified work as approved by the Engineer. All construction shall be re-worked to the satisfaction of the Engineer until specified requirements are met.

B. All additional work, which is the result of a failed inspection, shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 331113

SECTION 333113 - SANITARY SEWER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers all work associated with the furnishing and installation of all wastewater collection mains, service laterals, and their associated appurtenances.

1.2 PUBLIC UTILITY

A. The work shall be performed, installed, constructed, tested and approved in accordance with published specifications, standards, details and criteria of the Public Utility.

B. Public Utility that shall approve, operate and maintain the wastewater collection system is:

1. City of Rock Hill

C. Specifications are hereby incorporated as part of this specification and are available from the Public Utility's website.

1.3 SUBMITTALS:

A. Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for each of the following to be used in this project:

1. Sewer Pipe
2. Cleanout Frames and Covers

B. Field Testing: Submit field testing data as required by City of Rock Hill.

C. Operational Closeout Documentation: Provide documentation required by the Utility and SCDHEC to place the system into operation. Items include but are not limited to:

1. Record Drawings as required by City of Rock Hill.
2. Guarantee / Warranty Documentation

1.4 PRECONSTRUCTION CONFERENCE

A. A Pre-Installation Meeting shall be held with the Utility prior to construction. The Contractor shall notify the Utility and Engineer a minimum of 72 hours in advance of the meeting.

PART 2 - PRODUCTS

2.1 PUBLIC UTILITY

A. All products shall be furnished, installed, tested and approved in accordance with published specifications, standards, details and criteria of the Public Utility.

PART 3 - EXECUTION

3.1 PUBLIC UTILITY

A. The work shall be performed, installed, constructed, tested and approved in accordance with published specifications, standards, details and criteria of the Public Utility.

3.2 RECORD DATA

A. The Contractor shall keep accurate, legible records of the location of all piping, manholes, force mains, tees, and laterals. These records will be made available to the Engineer before his final review for incorporation into the Engineer's Record Drawings. Final payment to the Contractor will be withheld until all such information is received and accepted.

3.3 INSPECTIONS

A. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours notices prior to all required observations or tests.

B. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.

C. The Engineer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed properly in accordance with the drawings and specifications.

3.4 TESTING

A. General

1. The testing laboratory, Engineer and Owner shall be given a minimum of 72 hours notice prior to all tests.
2. All pressure testing shall be made at the Contractor's expense. Test locations shall be approved by the Engineer / City of Rock Hill.
3. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.

B. Sewer Testing as required by City of Rock Hill.

1. Low pressure Air Test for Gravity Lines

3.5 ACCEPTANCE

A. Final acceptance will be based on satisfactory materials, installation and construction of the specified work as approved by the Engineer. All construction shall be re-worked to the satisfaction of the Engineer until specified requirements are met.

B. All additional work, which is the result of a failed inspection, shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 333113

SECTION 334100 - SITE STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers all work associated with the excavation, installation and construction, backfilling and testing for storm drainage piping and structures as indicated on the drawings and as specified herein.

1.2 DEFINITIONS

A. Subgrade: Existing, in-situ soil or other material that is remaining after stripping or excavation. The subgrade is always existing material on which fill or new structures are to be placed.

B. Excavation: The removal of soil or material to obtain a specified depth or elevation.

C. Borrow: Material that must be transported to the site. A material that must be developed by others and transported to the site. Not available on site.

D. Backfill: Fill material used in refilling a cut, trench or other excavation.

E. Lift: A layer or course of material placed on top of a previously prepared or placed material.

F. Unsuitable Material: Existing, in situ soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability. Materials classified as PT, OH, or OL by ASTM D 2487 are unsuitable. Unsuitable materials also include man-made fills, refuse, frozen material, uncompacted backfills from previous construction, unsound rock or soil lenses, or other deleterious or objectionable material.

G. Granular Material: Soils classified as GW, GP, SW or SP by ASTM D 2487. Materials classified as GM and SM will be identified as granular only when fines have a plasticity index of zero.

H. Compaction: The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "*Degree of Compaction*" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D698 for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials, abbreviated in this specification as "___ *percent maximum density*".

I. Drainage Structure: Any structure constructed as part of the storm drainage collection or removal system. This includes catch basins, curb inlets, control structures, headwalls, flared end sections, junction boxes and manholes.

J. Bedding: The subgrade or fill material that directly supports the load of a pipe.

1.3 LUMP SUM PRICE

A. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the drawings and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which is it associated and shall be included in the lump sum price. The price shall be full compensation for the excavating, filling, transporting of material, compaction, shaping, finishing, dressing, disposal of surplus material, testing, staking, construction supervision and all other work required for satisfactory completion of the storm drainage operations.

B. Base bids on the following criteria:

1. Surface elevations as indicated.
2. No pipes or other man-made structures other than those indicated will be encountered. The utility locations shown are based on available information and are approximate and shall be field verified prior to beginning any work.
3. Borrow material in the quantities required are not available on site and must be developed and obtained by the Contractor.

1.4 UNIT PRICES

A. None this Section.

1.5 SUBMITTALS

A. Plans

1. Dewatering Plan: Describe methods for removing collected water from open trenches and diverting surface water or piped flow away from work area. Describe equipment and procedures for installing and operating the dewatering system indicated. Describe the basic components of the dewatering system proposed for use and its planned method of operation. Record performance and effectiveness of method or system in use. The dewatering plan shall address, as a minimum, the requirements identified in the paragraph titled “Drainage and Dewatering”

2. Shoring and Sheeting Plan: Describe the materials of the shoring system to be used. Indicate whether or not components will remain after filling or backfilling. Provide plans, sketches, or details along with calculations by a professional engineer. Indicate sequence and method of installation and removal.

B. Shop Drawings

1. Pre-Cast Structures and accessories

C. Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for the following:

1. Piping

a. Reinforced concrete pipe (RCP), including fittings and joint materials.
b. High density polyethylene pipe (HDPE), including fittings and joint materials.
c. High density polypropylene (PP), including fittings and joint materials.
d. Polyvinyl chloride pipe (PVC), including fittings and joint materials.
e. Ductile iron pipe (DIP), including fittings and joint materials.

2. Perforated Drain Piping

a. HDPE less than 12 inch diameter.
b. HDPE equal to or greater than 12 inch diameter.
c. PVC 4 inch and 6 inch only.

3. Pre-cast structures.
4. Cast iron frames, covers and gratings.
5. Cleanout materials.

D. Laboratory Testing: Submit testing data as identified in the paragraph titled “Laboratory Testing” for any of the following materials to be used on the project. Obtain approval before any material is delivered to the site.

1. Subgrade
2. Common fill
3. Controlled fill
4. Granular fill

E. Field Testing: Submit field testing data as identified in the paragraph titled “Field Testing” for the following:

1. Compaction and density tests for subgrade, excavation and fill/backfill
2. Leakage tests
3. Dye test

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage

1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store plastic piping, jointing materials, and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris

2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

B. Handling

1. Handle pipe, fittings, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care not to damage coatings and linings on pipe and fittings; if damaged, make repairs. Carry pipe to trench - do not drag.

1.7 REGULATORY REQUIREMENTS

A. Comply with federal, state, and local regulations.

B. Comply with the requirements of the land disturbance permit and stamped approved drawings issued for this project by the South Carolina Department of Health and Environmental Control (SCDHEC) and/or the MS4.

1.8 QUALITY ASSURANCE

A. Materials: The Contractor will furnish the Engineer and Owner all submittals identified in the paragraph “Submittals” before ordering. The Engineer will review the Contractor’s submittals and provide in writing an acceptance or rejection of material.

B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of two years and who provides published data on the quality and performance of the projects.

C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the contacts who are familiar with his competence may be required to be submitted to verify experience.

D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.

E. Testing Agencies: Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test. Agencies to be used shall be submitted to the Engineer for review prior to engagement.

PART 2 - PRODUCTS

2.1 CONCRETE PIPE

A. Circular concrete pipe shall be reinforced concrete pipe (RCP) conforming to ASTM C76, Class III. Provide Class IV where indicated on the drawings.

B. Horizontal elliptical concrete pipe shall be RCP conforming to ASTM C507, Class HE-III. Provide Class IV where indicated on the drawings.

C. Joints, including pipe and gasket material, shall meet ASTM C990 for tongue & groove with mastic sealant and ASTM C443 for bell & spigot or modified tongue & groove with O-ring rubber gasket.

D. Joint Sealants

1. O-Ring or Profile Gasket

   a. ASTM C443 and the manufacturer's recommendations.
   b. Installed at all locations.

2. Mastic/Butyl gaskets shall not be used.

2.2 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

A. Less than 12 inch diameter

1. ASTM F2648 or AASHTO M252, Type S.
2. Fittings and joints shall be at least the strength and capacity of the pipe and meet the requirements of ASTM F2306 or AASHTO M252, Type S.
3. Joints shall be soil-tight using an engaging dimple connection.

B. Equal to or greater than 12-inch diameter

1. ASTM F2648 or AASHTO M294, Type S.
2. Fittings and joints shall be at least the strength and capacity of the pipe and meet the requirements of ASTM F2306 or AASHTO M294, Type S.
3. Joints shall be soil-tight in accordance with ASTM F477.

C. The use of single wall, Type C pipe, is prohibited.

D. Pipe and fitting shall be manufactured by one manufacturer.

2.3 HIGH DENSITY POLYPROPYLENE (PP) PIPE

A. ASTM F2881 or AASHTO M330.

B. Fittings and joints shall be at least the strength and capacity of the pipe and meet the requirements of ASTM F2881 or AASHTO M330.

C. Watertight joints shall meet the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477.

2.4 POLYVINYL CHLORIDE (PVC) PIPE

A. Pipe shall meet ASTM D3034, SDR [**26**][**35**], having ends adaptable for elastomeric gasket joints.

B. Joints shall conform to ASTM D3212.

C. Gaskets shall conform to ASTM F477.

2.5 DUCTILE IRON PIPE (DIP)

A. Pipe shall conform to ANSI A 21.50 (AWWA C150) and ANSI A 21.51 (AWWA C 151) and ASTM A746. All pipe shall be Class 52 unless noted otherwise.

B. Joints shall be AWWA C111 / ANSI A21.11 push-on type with rubber gaskets meeting ASTM F477.

2.6 BOX CULVERTS

A. Box culverts shall be pre-cast concrete, subject to less than 2 feet of cover and HS-20 loadings, in accordance with ASTM C1433.

B. Joints shall be in accordance with ASTM C990.

C. Sealants shall be per the manufacturer's recommendations to pass the 10 psi pressure test in accordance with Chapter 10 of ASTM C990.

2.7 PERFORATED DRAIN PIPE

A. Perforated HDPE Piping

1. Less than 12 inch diameter: AASHTO M252, Type SP.
2. Greater than or equal to 12 inch diameter: AASHTO M294, Type SP.
3. HDPE perforated pipe shall be wrapped with subsurface drainage filter fabric in accordance with AASHTO M288-92, Class A.

B. Perforated PVC Piping (4 and 6 inch diameter only)

1. ASTM D2729.

2.8 DRAINAGE STRUCTURES

A. Construct of pre-cast concrete. Structures may be constructed of solid concrete masonry or cast-in-place concrete, in lieu of pre-cast concrete. Catch basins, headwalls, gutters, top of curb inlets, and bases shall be cast-in-place concrete.

1. Pipe-to-wall connections shall be mortared to produce smooth transitions and watertight joints or provided with ASTM C923 resilient connectors.
2. Bases shall have smooth inverts accurately shaped to a semicircular bottom conforming to the inside contour of the adjacent sewer sections.
3. Changes in direction of the sewer and entering branches into the manhole shall have a circular curve in the manhole invert of as large a radius as the size of the manhole will permit.

B. Concrete

1. Cast in place concrete shall be in accordance with SECTION “SITE WORK CONCRETE”.
2. Pre-cast concrete manholes shall be in accordance with ASTM C478. Provide a minimum wall thickness of 5 inches.
3. Pre-cast concrete catch basins, curb inlets and junction boxes shall be in accordance with ASTM C913. Provide a minimum wall thickness of 6 inches.
4. Reinforcing bars shall be in accordance with ASTM A615 and welded wire fabric shall be in accordance with ASTM A497.
5. Gaskets for joint connections shall be in accordance with ASTM C443 for O-rings and AASHTO M198, Type B for mastic sealants.

C. Masonry

1. Mortar: ASTM C270, Type M.
2. Brick: ASTM C32, Grade MS, or ASTM C62, Grade SW.
3. Concrete Masonry Units (CMU): ASTM C139.
4. Water for masonry mortar shall be fresh, clean, potable.
5. Grout: ASTM C476.

D. Frames, Covers and Grates

1. Castings shall be of uniform quality, free from blowholes, shrinkage, distortion and other defects. Metal used shall conform to ASTM A48-83, Class 35B for gray iron or ASTM A536-80, Grade 65-45-12 for ductile iron.
2. Frames and covers shall have continuously machined bearing surfaces to prevent rocking.
3. Dimensions shall be as indicated on the drawings, as a minimum. Variations in dimensions will be accepted provided that hydraulic capacity and load capacity are equal to or greater than that shown.
4. The Contractor is responsible for all coordination due to varying dimensions for frames and grates.

E. Flared end sections shall be same material as pipe material unless indicated otherwise. Flared ends are included in the lengths of pipe indicated.

2.9 SOIL MATERIALS

A. Provide rip rap in accordance with SECTION “RIP RAP”.

B. Provide soil materials as specified below free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, ice, or other deleterious and objectionable materials.

C. Bring trenches to grade indicated on the drawings using material excavated on the site of this project provided that the material is Class I, II, or III as defined in SECTION “EARTH MOVING”. In the event that material available on site does not meet Class I, II, or III, import material as required at no additional cost to the Owner.

D. Backfill trenches under roads, structures, and paved areas with controlled fill as specified in SECTION “EARTH MOVING”.

PART 3 - EXECUTION

3.1 GENERAL

A. Cutting Pavements, Curbs and Gutters

1. Saw cut with neat, parallel, straight lines 1 foot wider than trench width on each side of trenches and 1 foot beyond each edge of pits. When the saw cut is within 3 feet of an existing joint, remove pavement to the existing joint.

B. Location: Storm drainage piping and structures shall be at the locations, grades, inverts, and slopes indicated.

3.2 EARTHWORK

A. Topsoil: Strip, stockpile and place topsoil in accordance with SECTION “EARTH MOVING”.

B. Excavation

1. Keep excavations free from water while construction is in progress.
2. Immediately notify the Engineer, in writing, if it becomes necessary to remove rock or hard or unsuitable material to a depth greater than indicated.
3. Make trench sides as nearly vertical as practicable except where sloping of sides is allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the pipe.
4. Excavate ledge rock, boulders, and other unyielding material to an overdepth at least 6 inches below the bottom of the pipe and appurtenances unless otherwise indicated or specified. Overexcavate unsuitable material as indicated.
5. Use granular fill placed in 6 inch maximum layers to refill overdepths to the proper grade. At the Contractor's option, the excavations may be cut to an overdepth of not less than 4 inches and refilled to required grade as specified.
6. Grade bottom of trenches accurately to provide uniform bearing and support for each section of pipe or structure on undisturbed soil, or bedding material as indicated or specified at every point along its entire length except for portions where it is necessary to excavate for bell holes and for making proper joints. Dig bell holes and depressions for joints after trench has been graded. Dimension of bell holes shall be as required for properly making the particular type of joint to ensure that the bell does not bear on the bottom of the excavation. Trench dimensions shall be as indicated.

C. Bedding

1. Bedding shall be of materials and depths as indicated or specified for storm drainage piping and structures.
2. Place bedding in 6 inch maximum loose lifts.
3. Provide uniform and continuous support for each section of structure except at bell holes or depressions necessary for making proper joints.

D. Backfilling

1. Construct backfill in two operations (initial and final) as indicated and specified in this section.
2. Place initial backfill in 6 inch maximum loose lifts to 1 foot above pipe unless otherwise specified. Ensure that initially placed material is tamped firmly under pipe haunches. Bring up evenly on each side and along the full length of the pipe or structure. Ensure that no damage is done to the utility or its protective coating.
3. Place the remainder of the backfill (final backfill) in 9 inch maximum loose lifts unless otherwise specified. Compact each loose lift as specified in the paragraph entitled "Compaction" before placing the next lift.
4. Do not backfill in freezing weather or where the material in the trench is already frozen or is muddy, except as authorized. Provide a minimum cover from final grade of 2 feet for storm drains.
5. Where settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.
6. Coordinate backfilling with testing of storm drain pipes and structures. Testing for the storm drainage pipe and structures shall be complete before final backfilling.

E. Compaction

1. Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings. Compact material in accordance with the following unless otherwise specified. If necessary, alter, change, or modify selected equipment or compaction methods to meet specified compaction requirements.

2. Compaction of Bedding Material

   a. In soft, weak, or wet soils, tamp refill material to consolidate to density of adjacent material in trench wall. In stable soils, compact to 90% of maximum density.

3. Compaction of Backfill

   a. Compact initial backfill material surrounding pipes to 90% of maximum density except where bedding and backfill are the same material. Where bedding and backfill are the same material, compact initial backfill to the density of the bedding.
   b. Under areas to be seeded or sodded, compact succeeding layers of final backfill to 85% of maximum density.
   c. For utilities under railroad or highway right-of-way, structures and pavements compact succeeding layers of final backfill as specified under SECTION “EARTH MOVING”.

F. Structures

1. Provide at least 12 inches clear from outer surfaces to the embankment or shoring. Remove unsuitable material that is incapable of supporting the structure to an overdepth of 1 foot and refill with gravel or sand to the proper elevation. Refill overdepths with gravel, sand or concrete to the required grade and compact as specified.

G. Subsurface Drains

1. Excavation and Backfill

   a. Excavate to dimensions indicated. Provide a bedding surface of no more than 1 inch of sand, gravel or granular material and place on compacted material as indicated. Backfill around and over the pipes after pipe installation has been approved. Place granular material in 6 inch lifts and compact with mechanical, vibrating plate tampers or rammers until no further consolidation can be achieved. Compact backfill overlying the granular material as specified for adjacent or overlying work.

2. Filter Fabric

a. Wrap one layer of filter fabric around pipe in such a manner that longitudinal overlaps are in unperforated or unslotted quadrants of the pipe. Overlap fabric a minimum of 2 inches.
b. Secure fabric to pipe so that backfill material does not infiltrate through overlaps.
c. Place granular material and extend it for one pipe diameter, minimum of 6 inches on each side, and 18 inches above top of pipe or as indicated.
d. Place a layer of filter fabric on top of granular material before continuing with backfill.

3.3 PIPE LAYING AND JOINTING

A. General Requirements

1. Inspect each pipe and fitting before and after installation. Remove those found defective from site and replace with new.
2. Provide proper facilities for lowering sections of pipe into trenches. Lay pipe with the bell or groove ends in the upgrade direction.
3. Adjust spigots in bells and tongues in grooves to produce a uniform space. Blocking or wedging between bells and spigots or tongues and grooves will not be permitted.
4. Replace by one of the proper dimensions any pipe or fitting that does not allow sufficient space for proper caulking or installation of joint material.
5. At the end of each workday, close open ends of pipe temporarily with wood blocks or bulkheads.
6. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose.

B. Connections to Existing Lines or Structures

1. Notify the Engineer in writing at least 7 days prior to date that connections are to be made.
2. Obtain approval of the appropriate Authority Having Jurisdiction (AHJ) before interrupting service.
3. Conduct work so that there is minimum interruption of service on existing line.

C. Concrete Pipe

1. Install pipe and fittings in accordance with the provisions for rubber gasket jointing and jointing procedures of ACPA 01-103 or of ACPA 01-102, Chapter 9.
2. Make joints with the gaskets previously specified for joints with this piping. Clean and dry surfaces receiving lubricants, cements, or adhesives. Affix gaskets to pipe not more than 24 hours prior to the installation of the pipe.
3. Protect gaskets from sun, blowing dust, and other deleterious agents at all times. Before installation of the pipe, inspect gaskets and remove and replace loose or improperly affixed gaskets.
4. Align each pipe section with the previously installed pipe section and pull the joint together.
5. If, while pulling the joint, the gasket becomes loose and can be seen through the exterior joint recess when the pipe is pulled up to within 1 inch of closure, remove the pipe and remake the joint.

D. HDPE Pipe

1. Install in accordance with ASTM D2321 and the requirements of the HDPE pipe manufacturer.

E. PP Pipe

1. Install in accordance with ASTM D2321 and the requirements of PP pipe manufacturer.

F. PVC Pipe

1. Install pipe and fittings in accordance with the paragraph entitled "General Requirements" of this Article and with the requirements of ASTM D2321 for laying and joining pipe and fittings.

2. Make joints with the gaskets specified for joints with this piping; assemble in accordance with the requirements of ASTM D2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer

G. Perforated Drain Pipe

1. The laying of pipe and tile shall proceed upgrade from the lower end of the line and shall have a uniform pitch to the outlets.
2. Perforated pipe shall have joints made with standard coupling bands in a manner approved by the Engineer.

3.4 DRAINAGE STRUCTURES

A. Concrete Work

1. Perform cast-in-place concrete work in accordance with SECTION “SITE WORK CONCRETE”.

B. Manhole, Curb Inlet and Catch Basin Construction

1. Construct base slab of cast-in-place concrete or use pre-cast concrete base sections.
2. Provide sumps in structures in accordance with the drawings.
3. For cast-in-place concrete construction, either pour bottom slabs and walls integrally or key and bond walls to bottom slab.
4. For pre-cast concrete construction, make joints between sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Give a smooth finish to inside joints of pre-cast concrete structures.
5. Parging will not be required for pre-cast concrete manholes.
6. Cast-in-place concrete work shall be in accordance with the paragraph entitled, "Concrete Work."
7. Make joints between concrete structures and pipes entering structures with the resilient connectors specified for this purpose or mortared to produce a watertight joint; install in accordance with the recommendations of the connector manufacturer.
8. Where a new structure is constructed on an existing line, remove existing pipe as required to construct the structure. Cut existing pipe so that pipe ends are approximately flush with the interior face of structure wall, but not protruding beyond into the structure.

C. Metal Work

1. Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron and steel to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well-defined lines and arises. Provide rabbets, lugs, and brackets wherever necessary for fitting and support.

3.5 PROTECTION

A. Shoring and Sheeting

1. The Contractor is responsible for the design of all shoring and sheeting systems. Provide shoring, bracing or sheeting where required. In addition to the requirements of Section 25 A and B of COE EM-385-1-1, and other requirements of this contract meet the following:

a. Prevent the undermining of pavements, foundations and slabs.
b. Slope banks where space permits.

c. Where shoring and sheeting materials remain in place in completed work to prevent settlements or damage to adjacent structures as directed, backfill the excavation to 3 feet below the finished grade and remove the remaining portion of the shoring before completing the backfill.

B. Drainage and Dewatering

1. Plan for and provide structures, equipment and construction for the collection and disposal of surface and subsurface water encountered during construction.
2. Drainage: Dispose of surface water which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces. Surface dewatering plan shall include rerouting of any storm water runoff or natural drainage if necessary. Collect and dispose of surface and subsurface water encountered in the course of construction.

3. Dewatering

a. Groundwater flowing toward or into excavations shall be controlled to prevent sloughing or excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 1 foot below the working level.
b. Operate the dewatering system continuously, 24 hours per day, 7 days per week until construction work below existing water levels is complete. Have a back-up pump and system available for immediate use.

C. Erosion Control: Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the drawings.

D. Existing Utilities

1. All known utility facilities are shown schematically on the drawings and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown on drawings will not relieve the Contractor of his responsibility under this requirement. “Existing Utilities Facilities” means any utility that exists on the project in its original, relocated or newly installed position. The Contractor will be held responsible for the cost of repairs to damaged underground facilities; even when such facilities are not shown on the drawings.
2. The Contractor shall contact all utility companies prior to beginning work and request accurate field location of their respective utility lines.
3. Movement of construction machinery and equipment over pipes during construction shall be at the Contractor’s risk. Repair or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

E. Structures and Surfaces

1. Graded areas shall be protected from traffic, erosion, settlement, or any washing away that may occur from any cause prior to acceptance.
2. Any repair or reestablishment of final grades shall be made prior to final acceptance.

F. Disposal of Excavated Materials

1. Dispose of excavated material so that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of any facilities, or be detrimental to the completed work.

3.6 INSPECTIONS

A. Notify the Owner, Project Representative, Engineer and Authority Having Jurisdiction (AHJ) a minimum of 72 hours prior to all required observations, inspections or tests.

B. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation.

1. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him.

C. All work completed and materials furnished shall be subject to review by the Engineer or the Project Representative.

D. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon written notice.

1. The Engineer shall have the right to mark materials as rejected to distinguish them as such.

3.7 TESTING

A. All testing shall be made at the Owner's expense.

1. Test locations shall be approved by the Engineer.

B. The Testing Laboratory, Engineer and Owner shall be given a 72 hour notice, minimum, prior to all required tests.

C. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after tests are taken.

D. Independent Testing Laboratory

1. Independent Testing laboratory shall operate in accordance with ASTM E329 and shall be submitted to the Engineer for approval.
2. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results.
3. If any test performed fails to meet these specifications, Independent Testing Laboratory shall immediately notify the Owner, Engineer and Contractor.
4. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary.

a. The Contractor shall provide free access to the site for testing activities.

E. Laboratory Testing

1. Laboratory testing for maximum density and optimum moisture content for subgrade and backfill shall be performed in accordance with ASTM D698 for general soil types or ASTM D4253 or ASTM D4254 for isolated cohesionless materials.

2. Laboratory testing for mechanical analysis of subgrade and backfill shall be performed in accordance with ASTM D2487.
3. Laboratory testing for plasticity index of subgrade and backfill shall be performed in accordance with ASTM D4318

4. Frequency of Laboratory Testing

a. Native soil subgrade: One maximum density, optimum moisture content, mechanical analysis and plasticity index test for each material encountered that will serve as subgrade.
b. Fill/Backfill: One maximum density, optimum moisture content, mechanical analysis and plasticity index for each source and type of material to be used as backfill.

F. Field Testing

1. Earthwork

a. Field density tests for in-place materials shall be performed in accordance with one of the following:

1) Sand Cone Method: ASTM D1556
2) Balloon Method: ASTM D2167
3) Nuclear Method: ASTM D2922

2. Frequency of Field Testing

a. Subgrade for structure or pipe bedding

1) One test per 250 LF of piping outside of pavement areas; minimum of 1 per run between drainage structures.
2) One test per 100 LF of piping within pavement areas; minimum of 1 per run between drainage structures.
3) One test per drainage structure.

b. Backfill for drainage structure or pipe

1) One test per 250 LF of piping per lift outside of pavement areas; minimum of 1 per run between drainage structures.
2) One test per 100 LF of piping per lift within pavement areas; minimum of 1 per run per lift between drainage structures.
3) One test per drainage structure per lift.

3. Dye Test

a. A dye test must be performed by a licensed plumber for sanitary sewer connections to validate the connections are properly routed into the sanitary sewer system and not the storm sewer system.
b. Contractor is responsible for coordination and notification. A representative from the AHJ and Engineer shall be present for all testing and must be notified 72 hours prior to any testing.
c. Test results must be completed and submitted to the Engineer a minimum of 30 days prior to substantial completion.

3.8 AS-BUILT (RECORD) DRAWINGS

A. Upon completion of installation of the storm drainage system, a land surveyor registered in the State of South Carolina shall prepare and provide Preliminary Record Drawings to the Engineer for review.

1. As a minimum, these drawings shall show all storm drainage structures, storm pipes, pond size (stage/storage table), bottom elevations, top elevations, low flow channels, details of and pond outlet control structures and pertinent data input as attributes as required by York County, SCDHEC, and tied to State Plane Coordinates.
2. Record drawings shall accommodate the Engineer's seal, signature, and certification.

B. After review by the Engineer and York County, the Surveyor shall make all required changes and/or revisions and submit to the Engineer signed and sealed copies along with electronic media.

C. Contractor shall include in his project schedule 30 calendar days for the approval of the record drawings by York County and/or SCDHEC after incorporation of Engineer's comments.

3.9 ACCEPTANCE

A. Final acceptance will be based on satisfactory materials, installation and construction of the specified work as approved by the Owner, AHJ and/or Engineer.

B. If a tested material or system does not meet or exceed the specified requirements, the Contractor shall perform additional tests as directed by the Owner, AHJ and/or Engineer to adequately define the limits of the material not meeting the specifications.

1. Materials shall be re-tested to the satisfaction of the Owner, AHJ and/or Engineer until specified requirements are met.
2. All additional testing and work that is the result of a failed inspection or test shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 334100