PROJECT MANUAL

GRAND RAPIDS PUBLIC SCHOOLS

Project 1 - Houseman Field Replacement and
Project 2 - Briggs Field Replacement

10/28/2024

GRPS Facilities & Operations
900 Union Avenue NE
Grand Rapids, MI 49503

Telephone (616) 819-3010

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INSTRUCTIONS TO BIDDERS

PROJECT: Houseman Field Replacement and Briggs Field Replacement

OWNER: Grand Rapids Public Schools

DESIGN PROFESSIONAL: C2AE
50 Louis St, NW #200
Grand Rapids, MI 49503
315.386.2623

BID DATE: 11/13/2024

BID TIME: 2:00 pm

LOCATION FOR RECEIVING BIDS: Grand Rapids Public Schools
Facilities & Operations Building
900 Union Avenue NE
Grand Rapids, MI 49503

SUMMARY OF WORK

Scope of Work: Project consists of Houseman Field: replacement of the existing artificial playing surface and running track, sports field lighting. Repair to press box masonry and repair to masonry/stone/block wall along Houseman Ave. Briggs Field: replacement of running track, regrading and seeding of current grass field, improvements and installation of surface drainage system and irrigation; restoration of retaining wall and perimeter fencing, remodel to add restrooms to concessions building.

OBTAINING BID DOCUMENTS

Bid Documents may be obtained after 1:00 p.m. on 10/28/2024 on the GRPS website at https://www.grps.org/request-for-proposals.

EXAMINATION

Plans may be examined at the Plan Room noted.

Builders Exchange
678 Front Avenue NW Suite 330
Grand Rapids, MI 49546
(616) 949-8650
e-mail: projects@grbx.com

PRE-BID CONFERENCE

A pre-bid conference will be held at:

ADDRESS:	Facilities & Operations Building 900 Union Street NE Grand Rapids, MI 49503
DATE:	10/31/2024
TIME:	2:00 pm

Attendance at the pre-bid conference is ☐ MANDATORY ☒ NOT MANDATORY for those firms wishing to be considered for contract award.

CONTRACT DOCUMENTS

The Contract Documents, alone, detail the requirements of the project, and bids shall be based only on information presented there. Information obtained from others shall not affect the risks or obligations assumed the Constructor or relieve the Constructor from fulfilling any part of the contract.

SUBSTITUTIONS DURING THE BIDDING PERIOD

Unless otherwise noted, manufacturers and products not named in the specifications will be given consideration during the bidding period. Written approval from the Design Professional shall be obtained before a bidder uses substitute materials or manufacturers in its bid estimate. Bidders who base their bids on substitute materials or manufacturers without the Design Professional's written approval do so at their own risk.

Requests for substitutions during the bidding period must be received at least ten calendar days prior to bid date and may be emailed to the Design Professional at the email address noted above. The burden of showing the requested product is an adequate substitution for the specified product rests with the Bidder.

Substitution requests shall be reviewed by the Design Professional for quality and function, only. The Design Professional's approval of a substitution shall be communicated to all plan holders in an addendum. Bidders shall be responsible for any unforeseen costs that result from using an approved substitution.

TIME FOR COMPLETION

The Constructor shall be 100% complete with the work on or before 8/21/2025

Conditions precedent to establishing final completion include:

A. Final inspection and approval by all relevant agencies.
B. All punchlist items having been completed and accepted by Owner.
C. Manufacturer inspection, approval, and warranties.
D. Issuance of a Certificate of Occupancy, if necessary.

RESPONSIBILITY OF BIDDERS

Bidders shall study the bid documents and visit the site to satisfy themselves of all conditions before submitting a bid. It is incumbent upon bidders to reconcile any ambiguities, errors or omissions in the documents discovered during the bidding period.

It is the responsibility of each bidder to take those steps necessary to satisfy itself of the physical conditions under which the Work will be performed and the condition of the existing facilities, including those which may not be a part of the Work but could be affected by the performance of the Work, and (b) account for all general, local and prevailing conditions at or near the site that may in any manner affect the cost, schedule, progress or performance of the Work.

Questions about the bid documents, the intent of the design, or errors or omissions discovered in the documents shall be formally submitted to the Design Professional by email at the address given above not less than 10 calendar days prior to the date set for receipt of bids.

INSPECTION OF PREMISES

Inspection of premises will be arranged Monday through Friday from 9:00 AM until 3:00 PM for Houseman and Briggs Fields. Bidders may visit occupied buildings during those hours.

Call Ronnie Sluiter at Facilities & Operations at (616) 819-3010, prior to visiting a secured site, to arrange for entry and to receive custodial assistance.

COST CONSIDERATIONS

Unless specifically noted otherwise, bids shall include the following costs:

1. Permits, fees, notices, etc. for any federal, state or local government agency having jurisdiction over the project.
2. Inspections by building authorities and other government agencies.
3. Maintaining an environment in compliance with all rules, statutes, regulations and codes covering an occupied school facility.
4. All equipment required to fully and safely complete the work. No equipment shall be furnished by or borrowed from Owner.

5. Unless otherwise noted, during Constructor's performance of the Work, Owner will continue to occupy the building. The Constructor shall provide labor, materials and equipment to construct, maintain and remove all temporary enclosures needed to comply with State of Michigan Fire Code and/or to prevent dust, noise, odors and debris in a construction area from entering the remainder of the building.
6. During the school day, construction operations shall be limited to those methods and procedures that do not adversely affect the environment of Owner's occupied space, including noise, odors, dust, lighting hazards and other undesirable effects and conditions.
7. Prevailing Wages ☐ DO, ☒ DO NOT apply to this Project.

BID SECURITY

Bid security shall be made payable to "Grand Rapids Public Schools" in the form of a certified or cashier's check or money order drawn upon a bank insured by an agency of the Federal government, or an executed Bid Bond on ConsensusDocs form 262, AIA form A310, or a substantially similar form in the amount of 5% of the bid. A bid bond shall be executed with a surety authorized to do business in the State. A certified or cashier's check or money order submitted as bid security shall be held by the Owner until a contract has been executed.

BIDDING PROCEDURES

1. Bids shall be submitted on the Bid Form included with this document. All blank spaces shall be printed in ink or typewritten. The Bid Form must be fully completed, signed and sealed. In the event of a discrepancy between the words and figures entered on the Bid Form, the written word shall take precedence over the numerical figures.

2. Three originals of the bid shall be submitted in a sealed, opaque envelope bearing the following information clearly marked on the outside:

   Grand Rapids Public Schools
   Attn: Mr. Alex Smart, Executive Director of Facilities and Operations
   900 Union Avenue NE
   Grand Rapids, MI 49503

   Sealed bid(s) can either be for one or both of the referenced projects. Mark the outside of the envelope accordingly.
   Project 1 - Houseman Field Replacement or
   Project 2 - Briggs Field Replacement

   The envelope shall also bear on the outside the name of the bidding firm, its address and telephone number.

3. Also, an electronic PDF of the bid shall be sent to Alex Smart, smarta@grps.org and Marc Bennett, bennettm@grps.org.

4. Include bid security in the amount identified above.

5. Include a completed and signed Statement of Familial Relationship or the bid may be disqualified.

6. Include a completed and signed Iran Business Relationship Affidavit or the bid may be disqualified.

7. Include completed DTMB documents: Demographics, Statistics and Certification and Certification of a Michigan-based business. These forms are collected for statistical purposes and will not affect award of the contract.

8. Include a completed and signed Debarment and Suspension Certification.

9. Bids will be received until the time and date noted above at the location noted above, unless modified by Addendum, at which time all bids will be opened and read aloud.

10. Bids received after the date and time set for receipt of bids will not be considered or accepted.

11. Bids transmitted by fax, telephone, or electronic mail will not be accepted.

EVALUATION AND AWARD

1. The Owner may waive informalities or minor defects in a bid, may reject any and all bids, or may award to any bidder, regardless of bid amount, when the Owner deems it is in its best interest.

2. Any bid that is incomplete, obscure, or irregular may be rejected. Bids having erasures or corrections may be rejected. Bids that omit a price on any item in the Bid Form may be rejected. A bid for which unit prices are omitted or for which unit prices are, in the sole opinion of GRPS, unbalanced may be rejected. Any bid accompanied by insufficient or unacceptable bid surety may be rejected. A conditional or qualified bid may be rejected.

3. The Owner reserves the right to reject all bids if all bids exceed its budget for contract award.

4. In accordance with GRPS Policy 3670, a bid discount will be applied to bids from bidders who qualify as a local vendor. Non-local bidders can obtain a bid discount based on the percentage of the bid price that will be awarded to local subcontractors. Certification of the amount to be subcontracted will be required prior to award. GRPS Policy 3670 is attached to the Bid Form.

5. Upon approval of contract award by the GRPS Board of Education, the Owner will issue a Notice of Award to that bidder making Grand Rapids Public Schools the most advantageous offer. Payment and performance bonds will be required if the award amount is $50,000 or more. Once Notice of Award has been issued, the prospective contractor shall obtain and submit payment and performance

bonds, if necessary, insurance in accordance with the terms of the construction contract and any additional documentation requested by the Owner.

6. Upon receipt of acceptable payment and performance bonds, if necessary, an insurance certificate showing coverages and limits in accordance with the contract, and any additional documentation requested by the Owner, a contract will be forwarded for signature.

INSTRUCTIONS SUBSEQUENT TO AWARD

1. After executing a contract, the Owner will issue a Notice to Proceed identifying the agreed upon start date. No work shall be performed prior to the start date in the Notice to Proceed.

2. If requested, the Constructor will be furnished, free of charge, up to 3 copies of drawings and specifications, with Amendments current at time of award. Additional copies will be furnished, at cost, payable to the Owner.

BID FORM

Grand Rapids Public Schools

Project 1 - Houseman Field Replacement

Kent County, Michigan

DATE: _____ (Bidder to enter date)

SUBMITTED BY: (Bidder to enter name and address)

Bidder's Full Name: _____

Address: _____

City, State, Zip: _____

Telephone: _____ Fax: _____

E-Mail: _____

OFFER

A. Having examined the place of the Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by the Owner for the Project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the lump sum price of:

Total Project Base Bid: _____

_____ dollars ($_____), in lawful money of the United States of America.

Alternate 1: Houseman Field, All Interior Lighting Replacement with LED.

_____ dollars ($_____)

Alternate 2: Houseman Field, Replace All Exterior Non-Sports Lighting with LED.

_____ dollars ($_____)

Alternate 3: Houseman Field, Parking Lot Addition.

_____ dollars ($_____)

B. Bidders will complete the Work in accordance with the Contract Documents for the following Unit Price(s) items:

Item No.	Description	Unit	Est. Quant.	Bid Unit Price	Bid Amount
1	Asphalt Under Track and D-Zones	Tons	1,200		
2	Gravel Under Field and D-Zones	CY	3,300		

C. We have included bid security in the amount of 10% of the base bid as required by the Instructions to Bidders.

D. The cost of the 100% Payment and Performance Bonds included in the base bid is

$_____.

E. The base bid price includes all applicable taxes.

ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for sixty days from the date on which bids were opened.

B. If this bid is accepted by the Owner within the time period stated above, we will:

1. Furnish the required bonds and insurance certificates within ten days of receipt of Notice of Award.
2. Execute the Agreement immediately upon receipt from the Owner.
3. Commence work within ten days after written Notice to Proceed.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required bonds and insurance certificates, the bid security shall be forfeited as damages to Grand Rapids Public Schools by reason of our failure, limited in amount to the lesser of the face value of the bid security or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the bid security shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders, unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

CONTRACT TIME

A. If this Bid is accepted, we will complete all work on or before Completion Date. We understand that conditions precedent to achieving Final Completion include:

1. Final inspection and approval by all relevant agencies.
2. All punchlist items having been completed and accepted by Owner.
3. Manufacturer inspection, approval, and warranties.
4. Issuance of a Certificate of Occupancy, if necessary.

ADDENDA

A. We acknowledge receipt of the following Addenda. These addenda have been evaluated and their effect on the cost of the Work has been incorporated into the base bid entered above.

Addendum #	_____	Dated	_____	Addendum #	_____	Dated	_____
Addendum #	_____	Dated	_____	Addendum #	_____	Dated	_____

BID FORM SUPPLEMENTS

A. As requested by the Owner, the following additional information is included:

1. Schedule of Unit Prices: Complete the Schedule of Unit Prices attached to the Bid Form.

B. We agree to submit the following Supplements to Bid Forms within 48 hours after receipt of a Notice of Award:

1. Subcontractors: Include the names of all Subcontractors and the portions of the Work they will perform.

ACKNOWLEDGEMENTS

The Bidder acknowledges:

a. That this bid was developed without any collusion, undertaking, or agreement, either directly or indirectly, with any other bidder or bidders to maintain the prices of indicated Work or prevent any other bidder or bidders from bidding the Work.

b. That this bid shall not be withdrawn for a period of 60 calendar days after the date on which bids were opened.

c. That all work will be complete on or before the Final Completion date(s) identified in the bid documents.

d. That the following documents, identified in Instructions to Bidders, have been completed and are attached to this Bid Form:

1. Bid Security in the amount of 10% of the base bid
2. DTMB Demographics, Statistics and Certification
3. DTMB Certification of a Michigan-Based Business
4. Sworn Statement of Familial Relationship
5. Iran Business Relationship Affidavit
6. Debarment and Suspension Certification

SIGNATURE(S)

The Corporate Seal of _____ was hereunto affixed
(Print the full name of your firm)
In the presence of:

_____
Signature

(Seal)

_____
Printed Name and Title

_____
Date

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture as above.

AUTHORIZED CORPORATE OFFICER

_____
Signature

_____
Printed Name

_____
Title

_____
Date

BID FORM

Grand Rapids Public Schools

Project 2 - Briggs Field Replacement

Kent County, Michigan

DATE: _____ (Bidder to enter date)

SUBMITTED BY: (Bidder to enter name and address)

Bidder's Full Name: _____

Address: _____

City, State, Zip: _____

Telephone: _____ Fax: _____

E-Mail: _____

OFFER

A. Having examined the place of the Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by the Owner for the Project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the lump sum price of:

Total Project Base Bid: _____

_____ dollars ($_____), in lawful money of the

United States of America.

Alternate 1: Briggs Field, Furnish and install two additional bleacher sections as per Drawing C-102 to match existing the aluminum bleachers.

_____ dollars ($_____)

Alternate 2: Briggs Field, Replace the Perimeter Fence Fabric and Repair Damaged Section of Supports.

_____ dollars ($_____)

B. Bidders will complete the Work in accordance with the Contract Documents for the following Unit Price(s) items:

Item No.	Description	Unit	Est. Quant.	Bid Unit Price	Bid Amount
1	Asphalt Paving	Tons	30		

C. We have included bid security in the amount of 10% of the base bid as required by the Instructions to Bidders.

D. The cost of the 100% Payment and Performance Bonds included in the base bid is

$_____.

E. The base bid price includes all applicable taxes.

ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for sixty days from the date on which bids were opened.

B. If this bid is accepted by the Owner within the time period stated above, we will:

1. Furnish the required bonds and insurance certificates within ten days of receipt of Notice of Award.
2. Execute the Agreement immediately upon receipt from the Owner.
3. Commence work within ten days after written Notice to Proceed.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required bonds and insurance certificates, the bid security shall be forfeited as damages to Grand Rapids Public Schools by reason of our failure, limited in amount to the lesser of the face value of the bid security or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the bid security shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders, unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

CONTRACT TIME

A. If this Bid is accepted, we will complete all work on or before Completion Date. We understand that conditions precedent to achieving Final Completion include:

1. Final inspection and approval by all relevant agencies.
2. All punchlist items having been completed and accepted by Owner.
3. Manufacturer inspection, approval, and warranties.
4. Issuance of a Certificate of Occupancy, if necessary.

ADDENDA

A. We acknowledge receipt of the following Addenda. These addenda have been evaluated and their effect on the cost of the Work has been incorporated into the base bid entered above.

Addendum #	_____	Dated	_____	Addendum #	_____	Dated	_____
Addendum #	_____	Dated	_____	Addendum #	_____	Dated	_____

BID FORM SUPPLEMENTS

A. As requested by the Owner, the following additional information is included:

    1. Schedule of Unit Prices: Complete the Schedule of Unit Prices attached to the Bid Form.

B. We agree to submit the following Supplements to Bid Forms within 48 hours after receipt of a Notice of Award:

    1. Subcontractors: Include the names of all Subcontractors and the portions of the Work they will perform.

ACKNOWLEDGEMENTS

The Bidder acknowledges:

a. That this bid was developed without any collusion, undertaking, or agreement, either directly or indirectly, with any other bidder or bidders to maintain the prices of indicated Work or prevent any other bidder or bidders from bidding the Work.

b. That this bid shall not be withdrawn for a period of 60 calendar days after the date on which bids were opened.

c. That all work will be complete on or before the Final Completion date(s) identified in the bid documents.

d. That the following documents, identified in Instructions to Bidders, have been completed and are attached to this Bid Form:

    1. Bid Security in the amount of 10% of the base bid
    2. DTMB Demographics, Statistics and Certification
    3. DTMB Certification of a Michigan-Based Business
    4. Sworn Statement of Familial Relationship
    5. Iran Business Relationship Affidavit
    6. Debarment and Suspension Certification

SIGNATURE(S)

The Corporate Seal of _____ was hereunto affixed
(Print the full name of your firm)

In the presence of:

_____
Signature

(Seal)

_____
Printed Name and Title

_____
Date

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture as above.

AUTHORIZED CORPORATE OFFICER

_____
Signature

_____
Printed Name

_____
Title

_____
Date

GRPS Policy 3670 – Local Construction Contracting

The District provides a preference (bid discount) in construction contracts from local vendors, providing the quality and service are commensurate with the requirements set forth by the District as to satisfy the demands of the bid or proposal. Bids, or proposals when bids are not required, shall be accepted from non-local vendors in order to maintain a fair market price.

In determining the qualification for a Local Purchasing Preference for purposes of this policy, vendors must have obtained the Certification of a Michigan Based Business as determined by the Michigan Department of Technology, Management and Budget as well as meet one of the following criteria:

a. For at least the last six months had its primary business operations located within the municipality boundaries of the City of Grand Rapids, Michigan (Grand Rapids).

b. Be certified by the City of Grand Rapids, as a Micro-Local Business Enterprise and have its primary business operations within the municipality boundaries of the City of Grand Rapids.

A successful recipient of a contract and/or purchase order which has received a Local Purchasing Preference may be required to present proof of its status as a Michigan Based Business and documentation of its location within the City of Grand Rapids at any time upon request from an authorized District official. Failure to provide the requested information or failure to maintain business operations with the city of Grand Rapids for the duration of the contract will make the contract voidable at the District's discretion, and will result in disqualification from future consideration of a Local Purchasing Preference for a period of five years unless excused by the Superintendent or Designee.

Preference will be provided on the following basis:

a. Constructor Participation: Grand Rapids Public Schools will provide up to a 5% bid discount to prime contractors and/or construction managers who satisfy the criteria set forth for consideration as a Local Vendor.

b. Subcontractor Participation: Construction bids for non-local vendors may be discounted when a bidder on a Grand Rapids Public Schools' project voluntarily subcontracts with businesses meeting Local Vendor Criteria. Prime contractors and/or construction managers must submit affidavit(s) verifying Local Vendor subcontractor participation.

   Prime contractors and/or construction managers must require Local Vendor certification documentation to be submitted by each subcontract bidder with their sealed bid. The District at its discretion can request additional documentation for verification of the qualification of any Local Vendor subcontractor participating in a construction project.

c. The following is a schedule of discounted percentages based upon Local Vendor subcontractor participation achieved by the prime Constructor:

	LV Subcontractor Participation	Discount Percentage
i.	1.00% – 2.5%	1.0%
ii.	2.51% – 5.0%	1.5%
iii.	5.01% – 7.5%	2.0%
iv.	7.51% – 10.0%	2.5%
v.	10.01% – 15.0%	3.0%
vi.	15.01% – 18.0%	4.0%
vii.	18.01% +	5.0%

d. Prime contractors and/or construction managers may not terminate an approved Local Vendor subcontractor working on a Grand Rapids Public Schools construction project, and then perform the work on the terminated subcontract with its own forces or those of another subcontractor, without prior written consent by the Grand Rapids Public Schools Executive Director of Facilities Planning and Management. If a Local Vendor subcontractor fails to complete its work on the contract for any reason, a prime Constructor/construction manager must notify the Grand Rapids Public Schools

Executive Director of Facilities Planning and Management and make good faith efforts to find another approved Local Vendor subcontractor to substitute for the original Local Vendor subcontractor. Utilizing good faith efforts, and to the extent reasonable, the prime Constructor/construction manager shall substitute an approved Local Vendor subcontractor to perform the same amount of work under the contract as the Local Vendor subcontractor that was terminated.

e. Joint Venture Bidding: As an incentive to contractors engaging in activities that stimulate the growth and development of local, small emerging businesses as partners bidding as a joint venture, Grand Rapids Public School will apply up to a 5% bid discount for partnering with a qualified Local Vendor.

f. The Bid Discounts outlined above may not exceed 5% or $25,000 per bid, whichever is lower. Project bids from prime contractors and/or construction managers are considered a single bid for purposes of the Bid Discount consideration.

Grand Rapids Public Schools, Board of Education Members and employees are prohibited from having any financial interest or personal beneficial interest either directly or indirectly, in the award of any construction contracts, sub-contracts, or the recommendation/selection of any professional design service or construction manager, unless previously disclosed in writing to the Superintendent and approved in writing by the Superintendent.

This policy shall not apply to the extent that it would conflict with any provision of Michigan or federal law, regulation or constitution. The local preference shall not be applied to purchases of goods and services made with federal funds.

Policy Adopted: March 19, 2012

LEGAL Ref: MCL 380.1267; 380.1274
POLICY Ref: 3660 Bids and Quotation Requirements
3690 Local Purchasing
1900 Contracts and Board Member Disclosure Obligations

GRPS Policy Rules 3670R – Local Construction Contracting Regulations

Qualification for Local Construction Contracting Preference

On an annual basis beginning with July 1st of each fiscal year, a vendor desiring to receive a bid discount for local construction contracting may submit appropriate documentation to the Executive Director of Facilities and Operations. Appropriate documentation shall include the following:

a. Proof of completed submittal of Certification of a Michigan Based Business as determined by the Michigan Department of Technology, Management, and Budget

   and

b. Proof it has its primary business operations located within the municipality of the City of Grand Rapids, Michigan for the past six months (on company letterhead)

   or

   Proof it has been certified as a Micro-Local Business Enterprise by the City of Grand Rapids and has its primary business operations within the municipality boundaries of the City of Grand Rapids (on company letterhead)

A firm may submit the same documentation with its sealed bid or proposal in order to qualify for the bid discount.

Non-Local Vendors

A non-local vendor may qualify for a bid discount if it voluntarily subcontracts with businesses that meet the above documentation requirements. Proof of subcontractors meeting these requirements must be submitted with the sealed bid or proposal in order to qualify for the discount.

Local subcontractor participation will be based on the value of the local subcontracts as compared to the total bid or proposal

Joint Venture Bidding

Contractors that engage in joint venture bidding with a local, small emerging business partner will need to submit documentation of participation level with the sealed bid or proposal. The local bid discount will be based on the value of the local, small emerging business partner as compared to the total bid or proposal.

Eligibility/Verification

The District may request documentation at the conclusion of a project for which a bid discount was received verifying eligibility with local bid discount criteria. If it is determined that a vendor did not actually meet the terms of local preference, disqualification from future consideration of a local purchasing preference may occur for a period of five years unless excused by the Superintendent or Designee.

Dated: March 12, 2012
LEGAL REF: MCL 380.1267; 380.1274
3660- Bids and Quotation Requirements
3690- Local Purchasing
1900- Contracts and Board Member Disclosure Obligations

R 2/11

DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET
Facilities and Business Services Administration
Design & Construction Division

DEMOGRAPHICS, STATISTICS AND CERTIFICATION

1. Company Name: _____
2. Company Address: _____
   _____
   _____
3. Principal Place of Business: _____
   _____
4. Year of Establishment: _____

Woman-, Minority-, or Veteran-Owned Small Business Representation

(For Statistical Use Only)

DEFINITIONS:

"Woman-owned business" means a small business that is at least 51% owned by a woman or women who are US citizens and who control and operate the business.

The vendor represents that it ☐ IS ☐ IS NOT a woman-owned small business.

"Minority-owned business" means a small business that is at least 51% owned by a minority or minorities who are US citizens and who control and operate the business.

The vendor represents that it ☐ IS ☐ IS NOT a minority-owned small business.

☐ African-American ☐ Arab-American ☐ Asian-American ☐ Hispanic
☐ American Indian ☐ Eskimo

"Qualified Disabled Veteran" means a business entity that is 51% or more owned by one or more veterans with a service-connected disability.

"Qualified Disabled" means a business entity that is 51% or more owned by one or more with a service-connected disability.

The vendor represents that it ☐ IS ☐ IS NOT qualified disabled.

"Veteran -owned business" means a small business that is at least 51% owned by a veteran or veterans who are U.S. citizens and who control and operate the business.

The vendor represents that it ☐ IS ☐ IS NOT a veteran-owned small business.

The Constructor represents and warrants that the company meets the above (when checked) and can provide supportive documentation upon request.

Authorized Agent Name (print or type) _____

Authorized Agent Signature _____

Fraudulent Certification as a Qualified Disabled Veteran is subject to debarment under MCL 18.1264.

R 2/11

Certification of a Michigan-Based Business

(Information Required Prior to Contract Award
for Application of State Preference/Reciprocity Provisions)

DEFINITION: To qualify as a Michigan business, vendor must have, during the 12 months immediately preceding this bid deadline, or if the business is newly established, for the period the business has been in existence, it has (check all that apply):

Bidder shall also indicate one of the following:

☐ Bidder qualifies as a Michigan business (provide zip code): _____

☐ Filed a Michigan single business tax return showing a portion or all of the income tax base allocated or apportioned to the State of Michigan pursuant to the Michigan Single Business Tax Act, 1975 PA 228, MCL ˜208.1 – 208.145; or,

☐ Filed a Michigan income tax return showing income generated in or attributed to the State of Michigan; or,

☐ Withheld Michigan income tax form compensation paid to the bidder's owners and remitted the tax to the Department of Treasury; or

I certify that **I have personal knowledge** of such filing or withholding, that it was more than a nominal filing for the purpose of gaining the status of a Michigan business, and that it indicates a significant business presence in the state, considering the size of the business and the nature of its activities.

I authorize the Michigan Department of Treasury to verify that the business has or has not met the criteria for a Michigan business indicated above and to disclose the verifying information to the procuring agency.

☐ Bidder does not qualify as a Michigan business (provide name of State): _____

☐ Principal place of business is outside the State of Michigan, however service/commodity provided by a location within the State of Michigan (provide zip code):
_____

Authorized Agent Name (print or type) _____

Authorized Agent Signature _____

Fraudulent Certification as a Michigan business is prohibited by MCL 18.1268 §268. A BUSINESS THAT PURPOSELY OR WILLFULLY SUBMITS A FALSE CERTIFICATION THAT IT IS A MICHIGAN BUSINESS OR FALSELY INDICATES THE STATE IN WHICH IT HAS ITS PRINCIPAL PLACE OF BUSINESS IS GUILTY OF A FELONY, PUNISHABLE BY A FINE OF NOT LESS THAN $25,000 and subject to debarment under MCL 18.1264

SWORN STATEMENT OF FAMILIAL RELATIONSHIP

As required by Section 1267 of the Revised School Code – MCL 380.1267

STATE OF MICHIGAN COUNTY

OF _____

_____, being duly sworn, deposes and says:

That _____ (The "Bidder") has bid for an improvement to the following described project located in Kent County, Michigan, which is owned by the Grand Rapids Public Schools:

Project Name: Houseman Field Replacement and Briggs Field Replacement

That the following is a statement of disclosure of any familial relationship that exists between the owner or any employee of the Bidder and any member of the Grand Rapids Public Schools Board of Education or Superintendent, as required pursuant to Section 1267 of the Revised School Code, as amended.

1. ☐ That there are no such familial relationships existing at this time.

OR

2. ☐ That a familial relationship exists between

_____,

an ☐ owner ☐ employee of the Bidder who is the _____
relationship

of _____ , who is ☐ a member of the Board,

☐ the Superintendent.

Deponent _____

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

_____

Acting in: _____

My commission expires: _____

IRAN BUSINESS RELATIONSHIP AFFIDAVIT

Effective April 1, 2013 all bids, proposals, and/or qualification statements received in the State of Michigan must comply with the “Iran Economic Sanctions Act”. The following certification is to be signed and included at time of submittal.

Certification

Pursuant to the Michigan Iran Economic Sanctions Act, 2012 P.A. 517, by submitting a bid, proposal or response, Respondent certifies, under civil penalty for false certification, that it is fully eligible to do so under law and that it is not an “Iran linked business” as the term is defined in the Act.

_____	_____
Signature	Title
_____	_____
Company	Date

DEBARMENT AND SUSPENSION CERTIFICATION

The bidder, under penalty of perjury, certifies that, except as noted below, he/she or any other person associated therewith in the capacity of owner, partner, director, officer, manager:

- Is not currently under suspension, debarment, voluntary exclusion, or determination of ineligibility by any Federal agency;
- Has not been suspended, debarred, voluntarily excluded or determined ineligible by any Federal agency within the past 3 years;
- Does not have a proposed debarment pending; and,
- Is not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or Local) in any matter involving fraud or official misconduct within the past 3 years.

If there are any exceptions to this certification, insert the exceptions in the following space:

_____

_____

_____

_____

_____

_____

Exceptions will not necessarily result in denial or award, but will be considered in determining bidder responsibility. For any exception noted above, indicate below to whom it applies, initiating agency, and dates of action.

Notes: *Providing false information may result in criminal prosecution or administrative sanctions. The above certification is part of the Bid. Signing this document on the signature portion thereof shall also constitute signature of this Certification.*

_____ _____

Signature Title

_____ _____

Company Date

ATTACHMENT A

WORK DESCRIPTION
DRAWINGS, SKETCHES, SPECIFICATIONS

SECTION 01000

GENERAL REQUIREMENTS

PART 1 – GENERAL

1.1 FIELD CONDITIONS AND DIMENSIONS

A. Prior to doing any work, verify all dimensions, details, quantities, and conditions which may affect the work. No allowance for additional compensation will be considered for discrepancies between dimensions indicated on the drawings and actual field dimensions.

1.2 SUBSTITUTIONS AFTER CONTRACT AWARD

A. The Owner will consider substitution requests only if the proposed substitute offers the Owner cost or schedule advantages. A request for a substitution shall include a proposal for adjustments to the contract price and/or time if the substitution is approved. The Constructor shall bear the burden of providing the Design Professional any technical, cost or schedule data needed to evaluate the proposed substitution.

B. The Design Professional shall review the substitution proposal for quality and function, only. The Constructor shall be responsible for any unforeseen costs associated with using an approved substitution.

1.3 CONTRACT DOCUMENTS

A. The Contract Documents, alone, detail the requirements of the project. Information obtained from an officer, agent, consultant or employee of the Owner or any other person shall not affect the risks or obligations assumed or relieve the Constructor from fulfilling any part of the contract.

1.4 ASBESTOS

A. All material to be used in the work shall be certified by the manufacturer to be free of any amount of asbestos. No material will be permitted on the site without such certification.

B. The Constructor should review the Owner's material management plan for their information regarding asbestos. The Constructor must provide an affidavit stating that no asbestos was used in the project. Any asbestos containing material installed under this Contract by the Constructor shall be removed and replaced with like asbestos-free materials, all at the cost of the Constructor.

1.5 LEAD PAINT

A. Lead Paint: This renovation project may involve activities that disturb lead-based paint. It is the responsibility of the Constructor to determine if the building to be renovated is a **Child-Occupied Facility** as defined under the EPA regulation **Renovation, Repair, and Painting Final Rule (RRP Rule)**. All covered renovations to a **Child-Occupied Facility** must be performed by Certified Firms, using Certified Renovators and other trained workers.

1.6 PROGRESS MEETINGS

A. The Owner may schedule progress meetings to be held on the jobsite whenever needed to supply information necessary to complete the work without interruptions.

B. The Constructor shall be represented at each progress meeting by persons with full authority to act for the Constructor in regard to all portions of the work.

1.7 WORKMANSHIP

A. Except when the Contract Documents note otherwise, the Constructor shall be fully responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the work under the Contract with the Owner.

The Constructor shall provide an authorized representative at the site – at all times during working hours – to receive and execute orders by the Owner. All such orders given to the Constructor's representative shall be deemed as given to and received by the Constructor.

B. The Constructor shall maintain a copy of the Contract Documents at the project site at all times.

1.8 LAWS

A. The Constructor shall comply with all applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over the construction of the project.

1.9 CODE AND REGULATION COMPLIANCE

A. Comply with all applicable federal, state, and local codes and regulations relating to buildings, employment, the preservation of public health and safety, use of streets, and the performance of the work under this Contract. It shall be the responsibility of the Constructor to fully understand all such requirements and to ensure that the subject requirements are fully and faithfully enforced.

B. Any work performed that the Constructor knew or should have known was contrary to existing laws, rules and regulations, and for which the Constructor failed to give notice of such fact to the Owner, shall be the responsibility of the Constructor to correct. The Constructor shall bear all costs arising therefrom and hold the Owner harmless for any such violation.

C. Upon completion of the Work, the Constructor shall submit to the Owner a certificate of inspection by the governmental authority having jurisdiction, showing that all work subject to inspection has been properly inspected and approved to meet current code requirements.

D. Covid-19 Safety Update. In light of the Coronavirus Disease 2019 (COVID-19), GRPS is requiring special health and safety measures for everyone. All contractors must meet Federal, State, CDC and OSHA guidelines as it relates to Covid-19. Specifically, a safety plan that is in Compliance with OSHA 3990-3 2020 must be in place prior to work in any GRPS facilities.

1.10 PROJECT SAFETY

SAFETY IS OF ABSOLUTE IMPORTANCE. The Constructor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs associated with the Work. Under no circumstances shall the Constructor's activities jeopardize the safety of a building's occupants, construction workers or the general public.

A. All Work must be executed in accordance with applicable standards of the Construction Safety and Health Division of the State of Michigan Department of Licensing and Regulatory Affairs.

B. The requirements indicated in this section are to be considered the minimum. Where the requirements of any of the listed authorities having jurisdiction conflict with the requirements of this section, the maximum condition shall prevail.

C. The Constructor shall furnish, install and maintain as long as necessary and remove when no longer required, adequate barriers, warning signs and lights or other necessary or prudent safety measures at all dangerous locations during work operations for the protection of Constructor personnel, building occupants, and the general public. Provide and erect all such safety precautions in accordance with federal, state and local codes and other legal requirements.

D. Whenever lifting materials or equipment over or near existing or occupied buildings, provide advance notice of such activities and arrange to have any potentially endangered spaces vacated.

E. During work operations, provide temporary partitions, barriers, curtains, and guards as necessary to confine materials, dust and debris to the immediate work areas. Do not allow dust or debris to enter the building interior. Coordinate the location of temporary barriers or partitions with the Owner.

F. Remove all temporary protection when work is completed and restore disturbed areas to their original condition.

G. The Constructor shall hold the Owner harmless from damage or claims arising out of any injury or damage that may be sustained by any person or persons as a result of the work under the Contract.

1.11 PROTECTION OF PROPERTY

A. Coordinate all Work with the Owner so that adequate interior protection, as necessary, is provided and disruption to normal building operations is minimized. Repair all property damage caused by lack of such protection to the satisfaction of the Owner.

B. Confine equipment, storage of materials, debris, and the operation and movements of workmen within the physical limits and time limits directed by the Owner. Such activities are to be governed by applicable local building codes and the traffic regulation and safety and fire regulation of local authorities.

C. Document existing damage prior to the start of work to avoid responsibility for preexisting conditions. During work operations, provide protection for existing building, finishes, walks, drives, and landscaping in and adjacent to the work areas. Repair or replace building components or site property damaged during the work to match its condition before the damage. If the Constructor fails to repair or replace such damage, the Owner will have the work done by others and the costs of such work will be charged to the Constructor.

D. Do not store materials, tools, or equipment on any existing roof area adjacent to the work site unless proper protection of the existing roof is provided and the materials are spread out and located at column locations.

E. The Constructor shall hold the Owner harmless against all claims of damage or alleged damage to any such structure arising out of the work under this Contract.

1.12 FIRE SAFETY

A. No open fire is permitted on the building site at any time (except for torches to apply modified roof membrane).

B. Take all precautions to eliminate possible fire hazards at the site, including but not limited to the following:

1. Remove all combustible debris from the roof and storage areas on a daily basis.

2. Store highly flammable materials in well-ventilated areas; mixing and preparation of such materials is also restricted to such areas. Handle all such materials in accordance with safe practices and the requirements of authorities having jurisdiction.

3. The Constructor shall not store large quantities of flammable materials at the site.

1.13 VANDALISM

A. The cost for any damage by vandalism to material or equipment or that which occurs to items finished or installed under this contract, is to be borne by the Constructor. The Constructor is responsible for such vandalism from the date of the Notice to Proceed until Final Completion.

1.14 TEMPORARY UTILITIES AND FACILITIES

A. Water and electricity may be available in the area where work will be performed. If so, the Constructor will not be charged for reasonable use of these services for construction operations. The Constructor shall pay costs for installation and removal of any temporary connections including necessary safety devices and controls.

1.15 MISCELLANEOUS FACILITIES AND CONTROLS

A. New materials delivered to and stored outdoors on the jobsite shall be fully protected from weather by placement on raised platforms and shall have secure waterproof plastic coverings or tarpaulins. The waterproof plastic coverings or tarpaulins shall not extend all the way to the ground surface. They shall terminate a few inches above the ground surface. Factory-provided plastic wrap is not an acceptable waterproof covering.

B. Contractors and their employees or suppliers will not use or interfere with existing public access, drives, roads or parking lots, except as specifically indicated by prior arrangement with the Owner.

C. Constructor's employee parking, delivery trucks and other construction vehicle parking will only be allowed in areas designated by the Owner.

D. The Constructor shall provide and regularly maintain portable sanitary facilities at the site. The contractors' employees shall not utilize the restrooms in the school buildings.

1.16 NO SMOKING POLICY

A. The use of tobacco products on school property is a misdemeanor under MCL 750.473. No tobacco products will be allowed anywhere on school property at any time.

1.17 REMOVAL OF DEBRIS

A. Remove all rubbish and debris from the site daily or more often if directed by the Owner. The premises shall be maintained as clean as practical, consistent with the neatness required for the Owner's normal operations.

B. No storage of removed items or debris will be permitted on the site unless so directed by the Owner.

C. The location of the trash containers is subject to the Owner's approval.

D. During non-construction hours, cover and seal trash containers to prevent wind-blown debris and access into trash containers.

END OF SECTION

DOCUMENT 003132 - GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 GEOTECHNICAL DATA

A. This Document, with its referenced attachments, is part of the Procurement and Contracting Requirements for the Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.

B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, Owner, Architect, Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report accepts full responsibility for its use.

C. Soil-Boring Data for Project, obtained by Materials Testing Consultants (MTC), dated September 3, 2024, is available for viewing as appended to this Project Manual.

D. A Geotechnical Investigation Report for Project, prepared by Materials Testing Consultants (MTC), dated September 3, 2024, is available for viewing as appended to this Project Manual.

1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
2. Any party using information described in the geotechnical report will make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF DOCUMENT 003132

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)
Grand Rapids Public School District
1331 Martin Luther King Jr. Street SE
Grand Rapids, Michigan 49506

BOND AMOUNT: $

PROJECT:
(Name, location or address, and Project number, if any)
Grand Rapids Public School District 2023 Bond Program
Kent County, Michigan
Houseman Field Replacement and Briggs Field Replacement

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

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

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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User Notes: (1748578378)

Signed and sealed this day of ,

	(Contractor as Principal) *(Seal)*
(Witness)	*(Title)*
	(Surety) *(Seal)*
(Witness)	*(Title)*

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User Notes: (1748578378)

DOCUMENT 005100 - NOTICE OF AWARD

PART 1 - GENERAL

1.1 BID INFORMATION

A. Bidder: <**Insert successful Bidder name**>.

B. Bidder's Address: <**Insert street address, city, state, zip, and telephone**>.

C. Prime Contract: Project 1 - Houseman Field Replacement; Project 2 – Briggs Field Replacement.

D. Project Name: Project 1 - Houseman Field Replacement; Project 2 – Briggs Field Replacement.

E. Project Location: 162 Houseman Ave NE, Grand Rapids, MI and 1834 LaFayette Ave NE, Grand Rapids, MI.

F. Owner: Grand Rapids Public School.

G. Architect: C2AE.

H. Architect Project Number: Houseman Field Replacement, C2AE #24-0160; Briggs Field Replacement, C2AE #24-0162.

1.2 NOTICE OF INTENT TO AWARD CONTRACT

A. Notice: The above Bidder is hereby notified that their Bid, dated <**Insert date**>, for the above Contract has been considered and the Bidder will be awarded a Contract for <**Insert brief description of Work or sections of Work awarded**>.

B. Alternates Accepted: Accepted alternates are indicated in the Owner/Contractor Agreement.

C. Contract Sum: The Contract Sum[**including accepted alternates**] is:

1. <**Insert written amount**> dollars ($<**Insert numeric amount**>).
2. Indicated in the Owner/Contractor Agreement.

1.3 NOTICE OF AWARD OF CONTRACT

A. Notice: The above Bidder is hereby notified that their Bid, dated <**Insert date**>, for the above Contract has been considered and the Bidder is hereby awarded a Contract for <**Insert brief description of Work or sections of Work awarded**>.

B. Alternates Accepted: Accepted alternates are indicated in the Owner/Contractor Agreement.

C. Contract Sum: The Contract Sum[**including accepted alternates**] is:

1. <**Insert written amount**> dollars ($<**Insert numeric amount**>).
2. Indicated in the Owner/Contractor Agreement.

1.4 EXECUTION OF CONTRACT

A. Contract Documents: Executable copies of the Contract Documents will be made available to the Bidder immediately. The Bidder must comply with the following conditions precedent within [**10**]<**Insert number**> days of the above date of issuance

of the Notice:

1. Deliver to Owner [**three**]<**Insert number**> sets of fully executed copies of the Owner/Contractor Agreement[**and associated documents indicating a requirement for signature by the Contractor**].
2. Deliver with the executed Owner/Contractor Agreement the Bonds and Certificates of Insurance required by the Contract Documents.
3. <**Insert conditions precedent**>.

B. Compliance: Failure to comply with conditions of this Notice within the time specified will entitle Owner to consider the Bidder in default, annul this Notice, and declare the Bidder's Bid security forfeited.

1. Within [**10**]<**Insert number**> days after the Bidder complies with the conditions of this Notice, Owner will return to the Bidder one fully executed copy of the Owner/Contractor Agreement.

1.5 NOTIFICATION

A. This Notice is issued by:

1. Owner: Grand Rapids Public School.
2. Authorized Signature:

   _____.
3. Signed By: Alex Smart.
4. Title: Executive Director of Facilities and Operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF DOCUMENT 005100

DRAFT

AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

«Grand Rapids Public School District»«»
«1331 Martin Luther King Jr. Street SE
Grand Rapids, Michigan 49506»
«»
«»

and the Contractor:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

«Grand Rapids Public School District 2023 Bond Program»
«Kent County, Michigan»
«Houseman Field Replacement and Briggs Field Replacement»

The Architect:
(Name, legal status, address and other information)

«C2AE»«»
«50 Louis Street NW
Suite 200
Grand Rapids, Michigan 49503»
«Telephone Number: 616.454.9414»
«»

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

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User Notes: (1114192212)

TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

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6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[« »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

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[« »] By the following date: « »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

« »

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

« »

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ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« »

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§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

« »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

« »

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

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§ 6.2 Binding Dispute Resolution
For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[« »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

«Alex Smart»
«1331 Martin Luther King Jr. Street SE
Grand Rapids, Michigan 49506»
«»
«»
«»
«»

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

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§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with a building information modeling exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with a building information modeling exhibit, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 Building information modeling exhibit, dated as indicated below:
(Insert the date of the building information modeling exhibit incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

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[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
«Alex Smart»«, Executive Director of Facilities and Operations»	« »« »
(Printed name and title)	*(Printed name and title)*

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AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

Grand Rapids Public School District 2023 Bond Program
Kent County, Michigan
Houseman Field Replacement and Briggs Field Replacement

THE OWNER:
(Name, legal status and address)

Grand Rapids Public School District
1331 Martin Luther King Jr. Street SE
Grand Rapids, Michigan 49506

THE ARCHITECT:
(Name, legal status and address)

C2AE
50 Louis Street NW
Suite 200
Grand Rapids, Michigan 49503

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

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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15 CLAIMS AND DISPUTES

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

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

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§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

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

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon written protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to written protocols governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

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ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These

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obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

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

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

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

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

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

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§ 3.5 Warranty

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

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

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

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§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 Superintendent

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

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

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

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

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§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional,

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whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work,

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provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract

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

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

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the

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Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

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

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

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

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

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

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

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

§ 6.2 Mutual Responsibility

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

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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

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

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

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§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

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.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

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

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

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

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

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

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

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§ 8.2 Progress and Completion

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

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

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

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

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

§ 9.5 Decisions to Withhold Certification

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

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

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.5 damage to the Owner or a Separate Contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

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§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

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§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

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

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

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

- .1 employees on the Work and other persons who may be affected thereby;

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.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities

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proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the

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procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

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The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and

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approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

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

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

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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

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§ 15.1.7 Waiver of Claims for Consequential Damages

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

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

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

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

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

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

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

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

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

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

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

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

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

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

§ 15.4 Arbitration

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

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

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

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

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§ 15.4.4 Consolidation or Joinder

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

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

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

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DOCUMENT 007300 - SUPPLEMENTARY CONDITIONS

PART 1 - GENERAL

1.1 ARTICLE 1 GENERAL PROVISIONS

A. The following supplements modify AIA Document A201-2017, "General Conditions of the Contract for Construction." Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions remain in effect.

B. § 1.1 Basic Definitions
   1. § 1.1.1 The Contract Documents
      a. Add Section 1.1.1.1.
         1) § 1.1.1.1 The Contract Documents executed or identified in accordance with the Agreement prevail in case of inconsistency with subsequent versions made through manipulatable electronic operations.
   2. § 1.1.5 The Drawings
      a. Add Section 1.1.5.1.
         1) § 1.1.5.1 Where only part of the Work is indicated, similar parts are considered repetitive. Where any detail is shown and components thereof are fully described, similar details not fully described are deemed to incorporate similar material and construction.

C. § 1.2 Correlation and Intent of the Contract Documents
   1. Add Section 1.2.1.3.
      a. § 1.2.1.3 The Contractor acknowledges and agrees that the Contract Documents are sufficient to provide for the completion of the Work, including Work whether shown or described, which may reasonably be inferred to be required for the completion of the Work in accordance with information given in the Contract Documents.

1.2 ARTICLE 3 CONTRACTOR

A. § 3.3 Supervision and Construction Procedures
   1. Add the following sentence to the end of Section 3.3.2:
      a. The Contractor and subcontractors, consultants, sub-consultants, and vendors shall comply with applicable statutes and the following requirements.
   2. Add Sections .1, .2, .3, .4, and .5 to Section 3.3.2.
      a. .1 An employee of the Contractor, subcontractor, consultant, sub-consultant, or vendor found to be a registered sex offender shall not

perform any work under this Contract and shall not be permitted to enter Owner's property. Failure to comply may result in legal action and termination of the Contract for default.

b. .2 It is the Contractor's responsibility to ensure that subcontractors, sub-consultants and vendors involved with this Project are in compliance with applicable statutes.

c. .3 Employees of the Contractor, subcontractor, consultant, sub-consultant, and their vendors when on the Owner's property shall dress appropriately for a work environment and perform their work in a professional manner. Determination of compliance with this requirement shall be solely at the discretion of the Owner. Contractor shall immediately have noncomplying personnel leave the Owner's property.

d. .4 The Owner's facilities are tobacco-free facilities. Employees of the Contractor, subcontractor, consultant, sub-consultant, and their vendors shall refrain from use of tobacco products while on the Owner's property.

e. .5 Employees of the Contractor, subcontractor, consultant, sub-consultant, and their vendors shall comply with the Contractor's safety program, and with state and federal safety regulations. The Contractor shall provide a copy of the Contractor's written safety program to the Owner within three business days of request.

B. § 3.4 Labor and Materials

1. Add Section 3.4.2.3.

a. § 3.4.2.3 The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect for reviewing the Contractor's proposed substitutions and making agreed upon changes in the Drawings and Specifications resulting from such substitutions.

C. § 3.9 Superintendent

1. Add Sections .1 and .2 to Section 3.9.1.

a. .1 The Superintendent shall be considered competent if it has successfully completed at least two other similar projects of similar scope and complexity to this Project while serving in the role of Project Superintendent.

b. .2 The Superintendent shall be on-site while the Work is being performed.

2. Add Section 3.9.4.

a. § 3.9.4 The Contractor shall maintain the same approved Project Manager and Field Superintendent from the time of issuance of the Notice to Proceed until the Date of Substantial Completion, or shall submit proposed changes in personnel to the Architect in accordance with Section 3.9.2.

D. § 3.10 Contractor's Construction and Submittal Schedules

1. Add Section 3.10.4.

a. § 3.10.4 Based upon local weather data, the following 10-year average shall establish the number of rain days to be included in the Contractor's Construction Schedule as normal. Rain days are defined as periods of 24

hours within which precipitation is one-tenth (0.1) of an inch or greater. Rain days shall be understood to be workdays, exclusive of holidays, Sundays, and other nonworking days. Rain-related days will be considered based upon amounts of precipitation encountered during the construction process. The Contractor shall use these monthly averages when establishing the construction schedule for this project. Claims for delays due to abnormal rain delays will not be considered until the number of rain days during which critical path work is delayed exceeds the number allowed in the schedule as follows:

January:	7 Days	May:	11 Days	September:	12 Days
February:	6 Days	June:	5 Days	October:	6 Days
March:	6 Days	July:	7 Days	November:	9 Days
April:	7 Days	August:	7 Days	December:	7 Days

1) .1 Rain days, as identified above, are to aid contractors in their scheduling. These days are included in the total time allowed for construction as defined in Article 8 of these Supplementary Conditions. Used and unused days are not available for decreasing the Project Time nor may they be used to increase the Project Time unless the Contractor can prove its claim for weather-related delay based upon extreme conditions or Acts of God. Rain days shall cease upon the drying in/enclosure of the building.

1.3 ARTICLE 4 ARCHITECT

A. § 4.1 General

1. Add Section 4.1.1.1.

a. § 4.1.1.1 The term "Architect," "Architect/Engineer," or "Engineer" as used in the Contract Documents means the Architect or its authorized representative.

1.4 ARTICLE 5 SUBCONTRACTORS

A. § 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

1. Add Section 5.2.1.1.

a. § 5.2.1.1 Included in the above notification shall be names of persons or entities proposed as manufacturers, fabricators, or material suppliers for the products, equipment and systems proposed for the Work.

1.5 ARTICLE 8 TIME

A. § 8.3 Delays and Extensions of Time

1. Add Section 8.3.4.

a. § 8.3.4 If the progress or completion of the Work is delayed by any fault, neglect, act or failure to act on the part of the Contractor or anyone acting for or on behalf of the Contractor, then the Contractor shall, in addition to all obligations imposed by this Contract and by law upon the Contractor,

and at no cost or expense to the Owner, work such overtime or require the appropriate Subcontractor to work such overtime as may be necessary to make up for time lost and to avoid delay in the progress and completion of the Work. The Contractor shall pay the premium cost of such overtime work.

1) .1 For the purposes of this article, Subcontractors shall be deemed to be acting for and on behalf of the Contractor.

2. Add Sections 8.3.4.1 and 8.3.4.2.
   a. § 8.3.4.1 Requests for extensions of time due to unusual adverse weather conditions occurring prior to completion of the roof and temporary or permanent building enclosure will be evaluated by the Owner when submitted by the Contractor in accordance with requirements of Section 012600 "Contract Modification Procedures."
   b. § 8.3.4.2 Extensions of the Contract Time due to unusual adverse weather conditions do not entitle the Contractor to claims for cost due to extended project overhead.
3. Add Section 8.3.5.
   a. § 8.3.5 Should the progress or completion of the Work be delayed by any fault, neglect, act or failure to act on the part of the Contractor or anyone acting for or on behalf of the Contractor so as to cause any additional cost, expense, liability or damage to the Owner or any damage or additional cost or expense for which the Owner may or shall become liable, the Contractor does hereby agree to compensate the Owner for, and to indemnify the Owner against, all such costs, expenses, liabilities and damages.

1.6 ARTICLE 9 PAYMENTS AND COMPLETION

A. § 9.3 Applications for Payment
   1. Add Sections 9.3.1.3 and 9.3.1.4.
      a. § 9.3.1.3 Until the Work is 50 percent complete, the Owner shall pay 95 percent of the amount due to the Contractor on account of progress payments. At the time the Work is 50 percent complete and thereafter, Architect may certify remaining partial payments to be paid in full.
      b. § 9.3.1.4 The Owner may elect to reinstate the full Contract retainage if the manner of completion of the Work and its progress do not remain satisfactory to the Architect or if the Surety withholds or revokes its consent, or for other good and sufficient reasons.
   2. Add Sections 9.3.2.1, 9.3.2.2 and 9.3.2.3.
      a. § 9.3.2.1 In requesting payment for materials stored on- or off-site, the Contractor shall submit with its Application for Payment the following:
         1) .1 an itemized list of the stored material prepared in sufficient detail to identify the materials and their value, and including adequate photographic evidence on the stored material in place. Include an accounting for new items stored, paid items that continue in storage, and items previously stored and since incorporated in the Work.

2) .2 evidence such as bills of sale or such other proof as may be requested by the Architect to substantiate that the materials listed have been paid for by the Contractor, or, for materials stored at the site only, a notarized statement from the materials supplier stating that the materials will become the property of the Owner upon payment by the Owner to the Contractor.

b. § 9.3.2.2 For material stored off-site, the Contractor shall additionally submit with its Application for Payment the following:

1) .1 evidence that the materials are stored at the location previously agreed to in writing as provided by Section 9.3.2 of the General Conditions. No payment will be made for material stored off the site until the storage location has been agreed upon in writing. No payment will be made for material stored more than 50 miles from the Project site.
2) .2 evidence that the storage location is bonded in a manner satisfactory to the Architect.
3) .3 evidence that the materials are insured while in storage and while in transit to the site.
4) .4 evidence that transportation to the site will be provided by the Contractor.

c. § 9.3.2.3 Stored materials may be reviewed in their storage location by the Architect.

B. § 9.8 Substantial Completion

1. Add Section 9.8.1.1.

a. § 9.8.1.1 Substantial Completion shall also include final approval for occupancy and use by authorities having jurisdiction.

2. Add Sections 9.8.2.1 and 9.8.2.2.

a. § 9.8.2.1 The Architect shall be entitled to rely upon the Contractor's comprehensive list of items to be completed or corrected in conjunction with the Architect's inspection to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amount paid to the Architect for preparation of such comprehensive list of items if such preparation is required to facilitate the Architect's determination of Substantial Completion.

b. § 9.8.2.2 The Architect will review the general condition of the Work and the Contractor's comprehensive list prior to the Architect's inspection to determine whether the nature or scope of Work left to be completed or corrected will preclude immediate and full owner occupancy, and will not proceed with inspection for Substantial Completion, but will reschedule the inspection at such time that the Contractor has indicated that the Work remaining to be completed or corrected is consistent with the definition of Substantial Completion.

C. § 9.10 Final Completion and Final Payment

1. Add Section 9.10.2.1.

a. § 9.10.2.1 The Contractor shall furnish such evidence as may be necessary to show that out-of-state subcontractors or suppliers have fully met the requirements of payment of taxes as established in the law of the State or local subdivision thereof, which may be in effect at the time of final payment. The Owner will require the submission of such proof or evidence before final payment is approved or made.

2. Add Section 9.10.3.1.

a. § 9.10.3.1 Owner's Option Final Payment: If at the time Final Completion is scheduled there are remaining uncompleted items, the Contract may be closed and Contract closeout completed with an amount equal to 250 percent of the value of uncompleted items as determined by the Architect withheld as value to the Owner to provide for the Owner's completion of the Work and related costs for the Owner's and the Architect's additional services.

1.7 ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

A. § 10.2 Safety of Persons and Property

1. Add Section 10.2.2.1.

a. § 10.2.2.1 In the event that review, inspection, or other action by regulatory agencies or other parties results in the imposition of fines, fees, or other costs due to the failure of the Contractor to comply with said applicable laws, ordinances, rules, regulations and lawful orders, the Contractor shall hold harmless the Owner, the Architect, and the Owner's Separate Contractors, if any, from all consequences arising from the Contractor's noncompliance.

B. § 10.4 Emergencies

1. Add the following sentence to Section 10.4:

a. Nothing in this paragraph shall be construed as relieving the Contractor from the cost and responsibility for emergencies covered hereby, which with normal diligence, planning, and the close supervision of the Work as required under the Contract, could have been foreseen or prevented.

1.8 ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

A. § 12.2 Correction of Work

1. Add Section 12.2.2.1.1.

a. § 12.2.2.1.1 Leakproof Envelope Provision: The one-year period for correction of Work shall be extended to a two-year period for all exterior envelope elements of the Work should one or more fail to serve as a leakproof water and/or air barrier. The Contractors responsibility under this Section shall extend to the repair of all damage to the building and building

contents resulting from such failure.

2. Delete the words "one-year" from Subparagraphs 12.2.2.2 and 12.2.2.3.

B. § 12.3 Acceptance of Nonconforming Work

1. Add the following sentence to the end of Section 12.3:

a. The acceptance of nonconforming Work by the Owner shall be by written Change Order or Construction Change Directive, signed by the Owner's authorized representative. No person has authority to accept nonconforming Work except the Owner.

1.9 ARTICLE 13 MISCELLANEOUS PROVISIONS

A. Add Section 13.6.

1. § 13.6 Special Conditions

a. See Owner's Special Conditions document(s) appended to and made a part of these Supplementary Conditions, which include the following:

1) § 13.6.1 Provisions Required by law.
2) § 13.6.2 Other Required Provisions.
3) § 13.6.3 Student Privacy Provisions for Technology Agreement.
4) § 13.6.4 Owner Direct Purchase Process.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF DOCUMENT 007300

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Contractor's use of site and premises.
4. Work restrictions.
5. Specification and Drawing conventions.
6. Miscellaneous provisions.

1.2 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.3 PROJECT INFORMATION

A. Project Identification:

1. Project 1 - Houseman Field Replacement, C2AE #24-0160; 162 Houseman Ave NE, Grand Rapids, MI
2. Project 2 - Briggs Field Replacement, C2AE #24-0162; 1834 LaFayette Ave NE, Grand Rapids, MI

B. Grand Rapids Public Schools, 900 Union Avenue, NE, Grand Rapids, MI 49503.

1. Owner's Representative: Alex Smart, Executive Director of Facilities and Operations.

C. Architect: C2AE, 50 Louis St, NW #200, Grand Rapids, MI 49503.

1. Architect's Representative: Bob Winks, Project Manager.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. Project consists of Houseman Field: replacement of the existing artificial playing surface and running track, sports field lighting. Repair to press box masonry and repair to masonry/stone/block wall along Houseman Ave. Briggs Field: replacement of running track, regrading and seeding of current grass field, improvements and installation of surface drainage system and irrigation; restoration of retaining wall and perimeter fencing, remodel to add restrooms to concessions building and other Work indicated in the Contract Documents.

B. Type of Contract:

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

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

A. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits on Use of Site: Confine construction operations to limits indicated by the SESC drawing.
2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.6 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to between 7 a.m. to 6 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.

1. Weekend Hours: Limit work to between 7 a.m. to 6 p.m., approval to work weekend prior to the weekend work.

C. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain written permission before proceeding with disruptive operations.

D. Smoking and Controlled Substance Restrictions: Use of tobacco products , alcoholic beverages, and other controlled substances on Owner's property is not permitted.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost allowances.
3. Quantity allowances.
4. Contingency allowances.

C. Related Requirements:

1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.2 DEFINITIONS

A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

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

1.6 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

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

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 QUANTITY ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

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

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance,

equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.9 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, required maintenance materials, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs due to a change in the scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Contingency Allowance: Include a contingency allowance of $50,0000 for use to repair or replace damaged mortar joints on the Houseman Field Press Box.

B. Allowance No 2: Contingency Allowance: Include a contingency allowance of $75,000 for the repair and replacement of the stone and CMU mortar joints of the Houseman Field east and west retaining walls as identified by the owner and approved by change order.

C. Allowance No.3: Contingency Allowance: Include a contingency allowance of $25,000 to remove and relocate the existing Houseman Field archway on the north entrance to the new north entrance location shown on Drawings C-101 and C-102. Design to be approved Owner and issued via bulletin and change order.

D. Allowance No. 3: Contingency Allowance: Include a contingency allowance of $110,000.00 for use to provide repairs to the Briggs Field concrete retaining wall. This allowance includes the removal and replacement of damaged retaining wall sections identified by Owner and approved by change order.

E. Allowance No. 4: Contingency Allowance: Include a contingency allowance in the sum of $15,000 for the Briggs Field perimeter fence support repairs and replacement of damaged cross members. Include Allowance 4 in Alternate, as shown on Drawing C-101 and C102

   1. This allowance includes material cost, receiving, handling, and installation of the support members and will be administrated buy change order.

END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other Work of the Contract.

C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Houseman Field, All interior lighting replacement with LED.

1. Alternate: as indicated on Drawing Interior Lighting Alternate - E-101, E-102, E-103, E-104, E-105, E-106. Exterior lighting - those sheets plus EC100 & EC101.

B. Alternate No. 2: Houseman Field, replace all exterior non-sports lighting to include homa and visitor stand general lighting, pathway, exterior wall pack, and parking lot

lighting with LED.

1. Alternate: 1 as indicated on Drawing Alternate: as indicated on Exterior lighting - those sheets plus EC100 & EC101.

C. Alternate No. 3: Houseman Field, Parking lot addition.

1. Alternate: Add additional parking to Houseman Filed as indicated on Drawing C-102.

D. Alternate No. 4: Briggs Field, Furnish and install two additional bleacher sections as per Drawing C-102 to match existing the aluminum bleachers.

E. Alternate No. 5: Briggs Field, Replace the perimeter fence fabric and repair damage section of supports.

1. Alternate: Briggs Fiel, replace the fence fabric supports per Allowance 4 and as indicated on Drawing C-101 C-102 and as specified in Section 32113."

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.2 DEFINITIONS

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

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 to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
    b. Coordination of 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 substitutions 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 as well as names and addresses of architects and owners.
    h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.

i. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
j. 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.
k. 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 three 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 Architect's 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.

1.4 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.

1.5 PROCEDURES

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

1.6 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: 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 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:

1. Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:

1. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on form included in Project Manual.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect 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 Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within 5 days 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 Architect.

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 Architect.

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.

1.4 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
2. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

1.2 DEFINITIONS

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

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
    a. Project name and location.
    b. Owner's name.
    c. Name of Architect.
    d. Architect's Project number.
    e. Contractor's name and address.
    f. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:

a. Related Specification Section or division.
b. Description of the Work.
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.

1) Labor.
2) Materials.
3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site.

6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
8. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
9. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
10. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Architect by the end of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:
    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Transmittal: Electronic (PDF format) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the

Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Sustainable design action plans, including preliminary project materials cost data.
7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
11. Copies of building permits.
12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
13. Initial progress report.
14. Report of preconstruction conference.
15. Certificates of insurance and insurance policies.
16. Performance and payment bonds.
17. Data needed to acquire Owner's insurance.

J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
    a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706.
6. AIA Document G706A.
7. AIA Document G707.
8. Evidence that claims have been settled.
9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
10. Final liquidated damages settlement statement.
11. Proof that taxes, fees, and similar obligations are paid.
12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.

1.2 DEFINITIONS

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

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 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, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and in prominent location in each built facility. Keep list current at all times.

1.4 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 to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.5 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

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

1. Project name.
2. Owner name.
3. Name of Architect.
4. Architect's Project number.
5. Date.
6. Name of Contractor.
7. RFI number, numbered sequentially.
8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
13. Contractor's signature.
14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: Form bound in Project Manual

1. Attachments shall be electronic files in PDF format.

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

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

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

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within five 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. Use software log that is part of web-based Project management software.

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

1.6 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Architect's Data Files Not Available: Architect will not provide Architect's CAD drawing digital data files for Contractor's use during construction.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

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

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
4. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
5. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
6. Section 017900 "Demonstration and Training" for submitting video recordings of

1.2 DEFINITIONS

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

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

1.3 SUBMITTAL SCHEDULE

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

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal Schedule: Submit concurrently with startup construction

schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
4. 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 Architect's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled date of fabrication.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.
7. Names of subcontractor, manufacturer, and supplier.
8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
9. Category and type of submittal.
10. Submittal purpose and description.
11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
12. Drawing number and detail references, as appropriate.
13. Indication of full or partial submittal.
14. Location(s) where product is to be installed, as appropriate.
15. Other necessary identification.
16. Remarks.
17. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and

limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Paper Submittals:

1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
5. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using AIA Document G810 transmittal form.

E. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

F. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
    a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
3. Paper: Prepare submittals in paper form and deliver to Architect.

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 submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
    a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

E. 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.

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

1.6 SUBMITTAL REQUIREMENTS

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

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

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

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Electronic PDF preferred method.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    a. Project name and submittal number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.
    e. Number and title of applicable Specification Section.
    f. Specification paragraph number and generic name of each item.
3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
5. Paper Transmittal: Include paper transmittal, including complete submittal information indicated.
6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
7. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
8. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned

Sample set as a project record Sample.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

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

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.
2. 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.
3. 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.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel

certified.

H. Test and Research Reports:

1. 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 substrate preparation and primers required.
2. 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.
3. 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.
4. 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.
5. 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.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.7 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S REVIEW

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

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

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

E. Architect will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

1.10 ARCHITECT'S REVIEW

A. Action Submittals: Architect and Construction Manager will review each submittal, indicate corrections or revisions required, and return.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the

appropriate action.

2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and Construction Manager.

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 will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 013516 - ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes special procedures for alteration work.

1.2 DEFINITIONS

A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.

B. Consolidate: To strengthen loose or deteriorated materials in place.

C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.

D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.

F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.

G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.

H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.

I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.

J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.

K. Retain: To keep an element or detail secure and intact.

L. Strip: To remove existing finish down to base material unless otherwise indicated.

1.3 COORDINATION

A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.

1. Schedule construction operations in sequence required to obtain best Work results.
2. Coordinate sequence of alteration work activities to accommodate the following:
    a. Owner's continuing occupancy of portions of existing building.
    b. Owner's partial occupancy of completed Work.
    c. Other known work in progress.
    d. Tests and inspections.
3. Detail sequence of alteration work, with start and end dates.
4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
5. Use of elevator and stairs.
6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.

B. Pedestrian and Vehicular Circulation: Coordinate alteration work with circulation patterns within Project building(s) and site. Some work is near circulation patterns. Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

C. Coordination Meetings: Conduct coordination meetings specifically for alteration work at bi-weekly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, Architect, and Contractor, each specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of alteration work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to alteration work.
2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.
    a. Alteration Work Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed

within the Contract Time.

b. Schedule Updating: Revise Contractor's Alteration Work Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each entity present, including review items listed in the "Preliminary Conference for Alteration Work" Paragraph in this article and the following:

1) Interface requirements of alteration work with other Project Work.
2) Status of submittals for alteration work.
3) Access to alteration work locations.
4) Effectiveness of fire-prevention plan.
5) Quality and work standards of alteration work.
6) Change Orders for alteration work.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.

1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to Owner where directed at Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Alteration Work Subschedule:

1. Submit alteration work subschedule within seven days of date established for commencement of alteration work.

B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.

C. Alteration Work Program: Submit 15 days before work begins.

D. Fire-Prevention Plan: Submit 15 days before work begins.

1.6 QUALITY ASSURANCE

A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section and that has completed a minimum of five recent projects with a record of

successful in-service performance that demonstrates the firm's qualifications to perform this work.

1. Field Supervisor Qualifications: Full-time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on-site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
    a. Construct new mockups of required work whenever a supervisor is replaced.

B. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a "Lead-Safe Certified Firm" according to 40 CFR 745, Subpart E, and use only workers that are trained in lead-safe work practices.

C. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.

1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

D. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.

E. Safety and Health Standard: Comply with ANSI/ASSP A10.6.

1.7 STORAGE AND HANDLING OF SALVAGED MATERIALS

A. Salvaged Materials:

1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site.
5. Protect items from damage during transport and storage.

B. Salvaged Materials for Reinstallation:

1. Repair and clean items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during

handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft.
3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.

E. Storage Space:
1. Owner will arrange for limited on-site location(s) for free storage of salvaged material. This storage space does not include security for stored material.
2. Arrange for off-site locations for storage and protection of salvaged material that cannot be stored and protected on-site.

1.8 FIELD CONDITIONS

A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of measured drawings.
1. Comply with requirements specified in Section 013233 "Photographic Documentation."

B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide temporary barricades, barriers, and directional signage to exclude the

public from areas where alteration work is being performed.

3. Erect temporary barriers to form and maintain fire-egress routes.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.

B. Temporary Protection of Materials to Remain:

1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.

C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

D. Utility and Communications Services:

1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.

1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

F. Existing Roofing: Prior to the start of work in an area, install roofing protection as indicated on Drawings.

3.2 PROTECTION FROM FIRE

A. General: Follow fire-prevention plan and the following:

1. Comply with NFPA 241 requirements unless otherwise indicated.
2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
    a. If combustible material cannot be removed, provide fire blankets to cover such materials.

B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:

1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Notify Owner at least 24 hours before each occurrence, indicating location of such work.
2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
    a. Train each fire watch in the proper operation of fire-control equipment and alarms.
    b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
    c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
    d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
    e. Maintain fire-watch personnel at each area of Project site until 60 minutes after conclusion of daily work.

C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch

personnel are trained in fire-extinguisher and blanket use.

D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.

1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.

B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.

C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.

D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.

E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL ALTERATION WORK

A. Have specialty work performed only by qualified specialists.

B. Ensure that supervisory personnel are present when work begins and during its progress.

C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs.

D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.

E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.

1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 013516

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection 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 quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Requirements:

1. Section 012100 "Allowances" for testing and inspection allowances.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of 3 previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

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

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

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.

1. Mockups are used for one or more of the following:
    a. Verify selections made under Sample submittals.

b. Demonstrate aesthetic effects.
c. Demonstrate the qualities of products and workmanship.
d. Demonstrate successful installation of interfaces between components and systems.
e. Perform preconstruction testing to determine system performance.

2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) in accordance with 29 CFR 1910.7, by a testing agency accredited in accordance with NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

I. 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.

J. 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. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.3 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within

reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 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. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

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

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

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

F. Reports: Prepare and submit certified written reports and documents as specified.

G. Permits, Licenses, and Certificates: For Owner's record, 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.

1.5 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions,

tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

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

1. Project quality-control manager may also serve as Project superintendent.

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

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3. Owner-performed tests and inspections indicated in the Contract Documents.

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 the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

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

1.6 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, telephone number, and email address 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 inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.7 QUALITY ASSURANCE

A. 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. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

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, applying, 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 is similar in material, design, and extent to those indicated for this Project.

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

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

G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

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, demonstrate, repair, and perform service on installations 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's Responsibilities:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.

e. When testing is complete, remove test specimens and test 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 Architect, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

1.8 QUALITY CONTROL

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

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Payment for these services will be made from testing and inspection allowances specified in Section 012100 "Allowances," as authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

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

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

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

inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations 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 duties of Contractor.

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

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

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives 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 inspection. 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 inspection equipment at Project site.

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

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

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and

similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, 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

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms, including "requested," "authorized," "selected," "required," and "permitted," have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms, including "shown," "noted," "scheduled," and "specified," have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations, List: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; (see FGIA).
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; www.concrete.org.
9. ACP - American Clean Power; (Formerly: American Wind Energy Association); www.cleanpower.org.
10. ACPA - American Concrete Pipe Association; www.concretepipe.org.
11. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
12. AF&PA - American Forest & Paper Association; www.afandpa.org.
13. AGA - American Gas Association; www.aga.org.
14. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
15. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
16. AI - Asphalt Institute; www.asphaltinstitute.org.
17. AIA - American Institute of Architects (The); www.aia.org.
18. AISC - American Institute of Steel Construction; www.aisc.org.
19. AISI - American Iron and Steel Institute; www.steel.org.
20. AITC - American Institute of Timber Construction; (see PLIB).
21. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
22. AMPP - Association for Materials Protection and Performance; www.ampp.org.
23. ANSI - American National Standards Institute; www.ansi.org.

24. AOSA/SCST - Association of Official Seed Analysts (The)/Society of Commercial Seed Technologists (The); www.analyzeseeds.com.
25. APA - APA - The Engineered Wood Association; www.apawood.org.
26. APA - Architectural Precast Association; www.archprecast.org.
27. API - American Petroleum Institute; www.api.org.
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASA - Acoustical Society of America; www.acousticalsociety.org.
30. ASCE - American Society of Civil Engineers; www.asce.org.
31. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (see ASCE).
32. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
33. ASME - ASME International; American Society of Mechanical Engineers (The); www.asme.org.
34. ASSE - ASSE International; (American Society of Sanitary Engineering); www.asse-plumbing.org.
35. ASSP - American Society of Safety Professionals; www.assp.org.
36. ASTM - ASTM International; www.astm.org.
37. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
38. AVIXA - Audiovisual and Integrated Experience Association; www.avixa.org.
39. AWI - Architectural Woodwork Institute; www.awinet.org.
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
41. AWPA - American Wood Protection Association; www.awpa.com.
42. AWS - American Welding Society; www.aws.org.
43. AWWA - American Water Works Association; www.awwa.org.
44. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
45. BIA - Brick Industry Association (The); www.gobrick.com.
46. BICSI - BICSI, Inc.; www.bicsi.org.
47. BIFMA - Business and Institutional Furniture Manufacturer's Association; www.bifma.org.
48. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
49. BSI - British Standards Institution; www.bsigroup.com.
50. BWF - Badminton World Federation; www.bwfbadminton.com.
51. CARB - California Air Resources Board; www.arb.ca.gov.
52. CDA - Copper Development Association Inc.; www.copper.org.
53. CE - Conformite Europeenne (European Commission); www.ec.europa.eu/growth/single-market/ce-marking.
54. CEA - Canadian Electricity Association; www.electricity.ca.
55. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
56. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
57. CGA - Compressed Gas Association; www.cganet.com.
58. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
59. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
60. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
61. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.

62. CMHA - Concrete Masonry & Hardscape Association; (Formerly: National Concrete Masonry Association); www.masonryandhardscapes.org.
63. CPA - Composite Panel Association; www.compositepanel.org.
64. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
65. CRRC - Cool Roof Rating Council; www.coolroofs.org.
66. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
67. CSA - CSA Group; www.csagroup.org.
68. CSI - Cast Stone Institute; www.caststone.org.
69. CSI - Construction Specifications Institute (The); www.csiresources.org.
70. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
71. CTA - Consumer Technology Association; www.cta.tech.
72. CTI - Cooling Technology Institute; www.coolingtechnology.org.
73. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
74. DHA - Decorative Hardwoods Association; www.decorativehardwoods.org.
75. DHI - Door and Hardware Institute; www.dhi.org.
76. ECIA - Electronic Components Industry Association; www.ecianow.org.
77. EIMA - EIFS Industry Members Association; www.eima.com.
78. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
79. EOS/ESD - EOS/ESD Association, Inc.; Electrostatic Discharge Association; www.esda.org.
80. ESTA - Entertainment Services and Technology Association; www.esta.org.
81. EVO - Efficiency Valuation Organization; www.evo-world.org.
82. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
83. FGIA - Fenestration and Glazing Industry Alliance; https://fgiaonline.org.
84. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
85. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
86. FM Approvals - FM Approvals LLC; www.fmapprovals.com.
87. FM Global - FM Global; www.fmglobal.com.
88. FRSA - Florida Roofing and Sheet Metal Contractors Association, Inc.; www.floridaroof.com.
89. FSA - Fluid Sealing Association; www.fluidsealing.com.
90. FSC - Forest Stewardship Council U.S.; www.fscus.org.
91. GA - Gypsum Association; www.gypsum.org.
92. GS - Green Seal; www.greenseal.org.
93. HI - Hydraulic Institute; www.pumps.org.
94. HMMA - Hollow Metal Manufacturers Association; (see NAAMM).
95. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
96. IAS - International Accreditation Service; www.iasonline.org.
97. ICC - International Code Council; www.iccsafe.org.
98. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
99. ICPA - International Cast Polymer Association (The); www.theicpa.com.
100. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
101. IEC - International Electrotechnical Commission; www.iec.ch.
102. IEEE SA - IEEE Standards Association; https://standards.ieee.org.

103. IES - Illuminating Engineering Society; www.ies.org.
104. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
105. IGMA - Insulating Glass Manufacturers Alliance; (see FGIA).
106. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.org.
107. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
108. Intertek - Intertek Group; www.intertek.com.
109. ISA - International Society of Automation (The); www.isa.org.
110. ISFA - International Surface Fabricators Association; www.isfanow.org.
111. ISO - International Organization for Standardization; www.iso.org.
112. ITU - International Telecommunication Union; www.itu.int.
113. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
114. LPI - Lightning Protection Institute; www.lightning.org.
115. MBMA - Metal Building Manufacturers Association; www.mbma.com.
116. MCA - Metal Construction Association; www.metalconstruction.org.
117. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
118. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
119. MHI - Material Handling Industry; www.mhi.org.
120. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
121. MPI - Master Painters Institute; www.paintinfo.com.
122. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry, Inc.; www.msshq.org.
123. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
124. NACE - NACE International; (National Association of Corrosion Engineers International); (see AMPP).
125. NADCA - National Air Duct Cleaners Association; www.nadca.com.
126. NAIMA - North American Insulation Manufacturers Association; www.insulationinstitute.org.
127. NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
128. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
129. NBI - New Buildings Institute; www.newbuildings.org.
130. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
131. NCMA - National Concrete Masonry Association; (see CMHA).
132. NEBB - National Environmental Balancing Bureau; www.nebb.org.
133. NECA - National Electrical Contractors Association; www.necanet.org.
134. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
135. NEMA - National Electrical Manufacturers Association; www.nema.org.
136. NETA - InterNational Electrical Testing Association; www.netaworld.org.
137. NFHS - National Federation of State High School Associations; www.nfhs.org.
138. NFPA - National Fire Protection Association; www.nfpa.org.
139. NFPA - NFPA International; (see NFPA).
140. NFRC - National Fenestration Rating Council; www.nfrc.org.
141. NGA - National Glass Association; www.glass.org.
142. NHLA - National Hardwood Lumber Association; www.nhla.com.
143. NLGA - National Lumber Grades Authority; www.nlga.org.
144. NOFMA - National Oak Flooring Manufacturers Association; (see NWFA).

145. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
146. NRCA - National Roofing Contractors Association; www.nrca.net.
147. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
148. NSF - NSF International; www.nsf.org.
149. NSI - Natural Stone Institute; www.naturalstoneinstitute.org.
150. NSPE - National Society of Professional Engineers; www.nspe.org.
151. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
152. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
153. NWFA - National Wood Flooring Association; www.nwfa.org.
154. NWRA - National Waste & Recycling Association; www.wasterecycling.org.
155. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
156. PDI - Plumbing & Drainage Institute; www.pdionline.org.
157. PLASA - PLASA; www.plasa.org.
158. PLIB - Pacific Lumber Inspection Bureau; www.plib.org.
159. PVCPA - Uni-Bell PVC Pipe Association; www.uni-bell.org.
160. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
161. RFCI - Resilient Floor Covering Institute; www.rfci.com.
162. RIS - Redwood Inspection Service; (see WWPA).
163. SAE - SAE International; www.sae.org.
164. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
165. SDI - Steel Deck Institute; www.sdi.org.
166. SDI - Steel Door Institute; www.steeldoor.org.
167. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
168. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (see ASCE).
169. SIA - Security Industry Association; www.securityindustry.org.
170. SJI - Steel Joist Institute; www.steeljoist.org.
171. SMA - Screen Manufacturers Association; www.smainfo.org.
172. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
173. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
174. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
175. SPIB - Southern Pine Inspection Bureau; www.spib.org.
176. SPRI - Single Ply Roofing Industry; www.spri.org.
177. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
178. SSINA - Specialty Steel Industry of North America; www.ssina.com.
179. SSPC - SSPC: The Society for Protective Coatings; (see AMPP).
180. STI/SPFA - Steel Tank Institute/Steel Plate Fabricators Association; www.steeltank.com.
181. SWI - Steel Window Institute; www.steelwindows.com.
182. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
183. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
184. TCNA - Tile Council of North America, Inc.; www.tcnatile.com.
185. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.kbcdco.tema.org.
186. TIA - Telecommunications Industry Association; www.tiaonline.org.

187. TMS - The Masonry Society; www.masonrysociety.org.
188. TPI - Truss Plate Institute; www.tpinst.org.
189. TPI - Turfgrass Producers International; www.turfgrasssod.org.
190. TRI - Tile Roofing Industry Alliance; www.tileroofing.org.
191. ULSE - UL Standards & Engagement Inc.; www.ulse.org.
192. UL - UL Solutions Inc.; www.ul.com.
193. USAV - USA Volleyball; www.usavolleyball.org.
194. USGBC - U.S. Green Building Council; www.usgbc.org.
195. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
196. WA - Wallcoverings Association; www.wallcoverings.org.
197. WCLIB - West Coast Lumber Inspection Bureau; (see PLIB).
198. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
199. WDMA - Window & Door Manufacturers Association; www.wdma.com.
200. WI - Woodwork Institute; www.woodworkinstitute.com.
201. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
202. WWPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. CPSC - U.S. Consumer Product Safety Commission; www.cpsc.gov.
2. DOC - U.S. Department of Commerce; www.commerce.gov.
3. DOD - U.S. Department of Defense; www.defense.gov.
4. DOE - U.S. Department of Energy; www.energy.gov.
5. DOJ - U.S. Department of Justice; www.ojp.usdoj.gov
6. DOS - U.S. Department of State; www.state.gov.
7. EPA - United States Environmental Protection Agency; www.epa.gov.
8. FAA - Federal Aviation Administration; www.faa.gov.
9. GPO - U.S. Government Publishing Office; www.gpo.gov.
10. GSA - U.S. General Services Administration; www.gsa.gov.
11. HUD - U.S. Department of Housing and Urban Development; www.hud.gov.
12. LBNL - Lawrence Berkeley National Laboratory; Energy Technologies Area; www.lbl.gov/.
13. NIST - National Institute of Standards and Technology; www.nist.gov.
14. OSHA - Occupational Safety & Health Administration; www.osha.gov.
15. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.

16. USACE - U.S. Army Corps of Engineers; www.usace.army.mil.
17. USDA - U.S. Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
18. USDA - U.S. Department of Agriculture; Rural Utilities Service; www.usda.gov.
19. USP - U.S. Pharmacopeial Convention; www.usp.org.
20. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from U.S. Government Publishing Office; www.govinfo.gov.
2. DOD - U.S. Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.dsp.dla.mil/Specs-Standards/.
3. DSCC - Defense Supply Center Columbus; (see FS).
4. FED-STD - Federal Standard; (see FS).
5. FS - Federal Specification; Available from DLA Document Services; www.dsp.dla.mil/Specs-Standards/.
    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from U.S. General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.
6. MILSPEC - Military Specifications and Standards; (see DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (see USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. BEARHFTI; California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; (see BHGS).
2. BHGS; State of California Bureau of Household Goods and Services; (Formerly: California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation); www.bhgs.dca.ca.gov.
3. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.oal.ca.gov/publications/ccr/.
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; https://tfsweb.tamu.edu/.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
2. Section 012100 "Allowances" for allowance for metered use of temporary utilities.

1.2 USE CHARGES

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

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

F. Dust Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

1. Waste-handling procedures.
2. Other dust-control measures.

G. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by Owner. Include the following:

1. Methods used to meet the goals and requirements of Owner.
2. Concrete cutting method(s) to be used.
3. Location of construction devices on the site.
4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.

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.

1.5 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link

fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts**,** with 1-5/8-inch- OD top rails

B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.

C. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.

D. Wood Enclosure Fence: Plywood, 6 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.

E. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.

F. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.

G. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices:

1. Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
3. Drinking water and private toilet.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
2. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system] as directed by authorities having jurisdiction.

C. Water Service:

1. Install water service and distribution piping in sizes and pressures adequate for construction.
2. Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

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

1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Electric Power Service:

1. Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
2. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
    a. Install electric power service underground unless otherwise indicated.
    b. Connect temporary service to Owner's existing power source, as directed

by Owner.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment for each field office.

1. At each telephone, post a list of important telephone numbers.

a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Contractor's emergency after-hours telephone number.
e. Architect's office.
f. General Contractor’s home office.
g. Engineers' offices.
h. Owner's office.
i. Principal subcontractors' field and home offices.

I. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.

2. Utilize designated area within existing building for temporary field offices.
3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

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

C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction

operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 312000 "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with Section 321216 "Asphalt Paving."

D. 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.

E. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

F. Storage and Staging: Use designated areas of Project site for storage and staging needs.

G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

H. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touch up signs, so they are legible at all times.

I. Waste Disposal Facilities:

1. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
2. 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."

J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

L. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

M. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

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

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

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:

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:

1. Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
2. Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize

attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

G. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations].
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

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

J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

K. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard, with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
4. Insulate partitions to control noise transmission to occupied areas.
5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.

6. Protect air-handling equipment.
7. Provide walk-off mats at each entrance through temporary partition.

L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

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

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure

but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

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

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at

temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes: General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

1.2 DEFINITIONS

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

B. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

1.3 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings:

1. Include plans, elevations, and sections showing trees and plants to be protected, locations of protection-zone fencing and signage, and the relationship between equipment-movement routes and material storage locations with protection zones.

C. Samples: For each type of the following:

1. Organic Mulch: Sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
2. Protection-Zone Fencing: Assembled Samples.

D. Protection-Zone Signage: Full-size Samples.

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

1.4 INFORMATIONAL SUBMITTALS

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

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

C. 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.

1.5 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA and licensed arborist in Michigan.

1.6 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. 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.

B. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements: Previously used materials may be used when approved by Architect.

1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; 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 apart.

a. Height: 48 inches.
b. Color: High-visibility orange, nonfading.

2. Gates: swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 36 inches.

C. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering.

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.

3.2 PREPARATION

A. 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.

3.3 TREE PROTECTION

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

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

B. Trunk Protection: Protect the trunk of each tree to remain as follows:

1. Wrap trunk with orange plastic construction fencing to 2 inches in thickness or minimum 1/4-inch closed-cell foam pads. Install 2-by-4-inch wood planks around trunk over wrap at maximum 3 inches apart. Minimum three planks per tree. Band together with no less than three steel bands stapled to the planks to hold them securely in place.

    a. Height: 48 inches.
    b. Trunk protection to remain in place no longer than 6 months. If construction exceeds the timeframe indicated, inspect trunk protection at 6-month intervals and loosen if necessary.

3.4 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected areas except by entrance gates.

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.
2. Access Gates: Install and adjust to operate smoothly, easily, and quietly; free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
3. Plastic Fencing: Stretch fabric taut and secure to posts without bows or sags.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect, on protection-zone fencing, but no fewer than 4 signs with each facing a different direction.

C. Maintain protection zones free of weeds and trash.

D. 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.

3.5 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones in accordance with 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.

3.6 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. Temporarily support and protect roots from damage until they are permanently covered with soil.
3. Cover exposed roots with burlap and water regularly.
4. Backfill as soon as possible in accordance with requirements in Section 312000 "Earth Moving."

B. Root Pruning at Edge of Protection Zone: Prune tree roots 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.

3.7 CROWN PRUNING

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

1. Prune to remove only 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 in accordance with ANSI A300 (Part 1).

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

C. Do not paint or apply sealants to wounds.

D. Chip removed branches and spread over areas identified by Architect.

3.8 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. 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.

C. Minor Fill within Protection Zone: Where existing grade is 2 inches 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.

3.9 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.

3.10 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. Perform repairs of damaged trunks, branches, and roots within 24 hours in accordance with arborist's written instructions.
2. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

END OF SECTION 015639

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of This 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 011000 "Summary" for Contractor requirements related to Owner-furnished products.
2. Section 012100 "Allowances" for products selected under an allowance.
3. Section 012300 "Alternates" for products selected under an alternate.
4. Section 014200 "References" for applicable industry standards for products specified.
5. Section 017700 "Closeout Procedures" for submitting warranties.

1.2 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. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products unless otherwise indicated.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in "Comparable Products" Article, 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. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluating Comparable Products: 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. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

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 or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.3 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. Resolution of Compatibility Disputes between Multiple Contractors:
    a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
    b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, the Architect will determine which products will 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 inconspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service- 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 equipment identification requirements.

1.4 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.5 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 that products are undamaged and properly protected.

C. Storage:
   1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
   2. Store products to allow for inspection and measurement of quantity or counting of units.
   3. Store materials in a manner that will not endanger Project structure.
   4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
   5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections are to 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 standard warranty form furnished by individual manufacturer for a particular product and issued in the name of Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of Owner or endorsed by manufacturer to 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 in the Project Manual, 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," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in Specifications

establish salient characteristics of products.

6. Or Equal: For products specified by name and accompanied by the term "or equal," "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 Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by 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 not be considered unless otherwise indicated.
    a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
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 that complies with requirements.
    a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
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 not be considered unless otherwise indicated.
    a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
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 that complies with requirements.

a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

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 may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
    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 the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
    1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

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

E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following 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.
    2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. 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.

3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for a comparable product. Architect will notify Contractor of approval or rejection of proposed comparable product within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

1. Architect's Approval of Submittal: Marked with approval notation from Architect's action stamp. See Section 013300 "Submittal Procedures."
2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 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.
3. Installation.
4. Cutting and patching.
5. Coordination of Owner's portion of the Work.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.

B. Related Requirements:

1. Section 011000 "Summary" for coordination of, and limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.

1. Prior to submitting cutting and patching plan, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
    a. Contractor's superintendent.
    b. Trade supervisor responsible for cutting operations.
    c. Trade supervisor(s) responsible for patching of each type of substrate.

d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.

2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

B. Layout Conference: Conduct conference at Project site.

1. Prior to establishing layout of new and existing perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:

a. Contractor's superintendent.

b. Professional surveyor responsible for performing Project surveying and layout.

c. Professional surveyor responsible for performing site survey serving as basis for Project design.

2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
3. Review requirements for including layouts on Shop Drawings and other submittals.
4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certified Surveys: Submit digital copy signed by land surveyor.

C. Certificates: Submit certificate signed by land surveyor, certifying that location and elevation of improvements comply with requirements.

D. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

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

1.5 CLOSEOUT SUBMITTALS

A. Final Property Survey: Submit three printed and one digital showing the Work performed and record survey data.

1.6 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."

C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Plumbing piping systems.
    f. Mechanical systems piping and ducts.
    g. Control systems.
    h. Communication systems.
    i. Fire-detection and -alarm systems.
    j. Conveying systems.
    k. Electrical wiring systems.
    l. Operating systems of special construction.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Exterior curtain-wall construction.
d. Sprayed fire-resistive material.
e. Equipment supports.
f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. 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 EXAMINATION

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

1. Before construction, verify the location and invert elevation at points of

connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

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

B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

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

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

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.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.

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 satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

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

E. Sequence the Work and allow adequate clearances to accommodate movement of

construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.6 CUTTING AND PATCHING

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

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

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

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

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

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, in accordance with regulations.
    a. Use containers intended for holding waste materials of type to be stored.
4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces in accordance with written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

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

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

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

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 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. List of incomplete items.
4. Submittal of Project warranties.
5. Final cleaning.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Section 017900 "Demonstration and Training" for requirements to train Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

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

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

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest-control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items

required by 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, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
    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 Architect's signature for receipt of submittals.
5. Submit testing, adjusting, and balancing records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

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

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.

7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.7 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 in accordance with Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list will state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.
5. Submit Final Completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than

date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

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

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit on digital media acceptable to Architect.

E. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

F. 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.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building

cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Clean flooring, removing debris, dirt, and staining; clean in accordance with manufacturer's instructions.
    i. Vacuum and mop concrete.
    j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean in accordance with manufacturer's instructions if visible soil or stains remain.
    k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    l. Remove labels that are not permanent.
    m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    p. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
    q. Clean strainers.
    r. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste-disposal requirements in Section

015000 "Temporary Facilities and Controls."

3.2 CORRECTION OF THE WORK

A. Complete repair and restoration operations required by "Correction of the Work" Article in Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

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

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of Record Drawings as follows:
    a. Initial Submittal:
        1) Submit one paper-copy set(s) of marked-up record prints.
        2) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
        3) Submit Record Digital Data Files and one set(s) of plots.
        4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    b. Final Submittal:
        1) Submit three paper-copy set(s) of marked-up record prints.
        2) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.
        3) Print each drawing, whether or not changes and additional information were recorded.
    c. Final Submittal:
        1) Submit one paper-copy set(s) of marked-up record prints.
        2) Submit Record Digital Data Files and three set(s) of Record Digital Data File plots.
        3) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report weekly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.3 RECORD DRAWINGS

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

1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding 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.
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 Construction Change Directive.
k. Changes made following Architect'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 prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
2. Format: DWG, Current Version, Microsoft Windows operating system.
3. Format: Annotated PDF electronic file with comment function enabled.
4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
5. Refer instances of uncertainty to Architect for resolution.
6. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
    a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
    b. Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

1.4 RECORD SPECIFICATIONS

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

modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
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.

B. Format: Submit record specifications as annotated PDF electronic file.

1.5 RECORD PRODUCT DATA

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. 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 and Record Drawings where applicable.

C. Format: Submit Record Product Data as annotated PDF electronic file.

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

1.6 MISCELLANEOUS RECORD SUBMITTALS

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

B. Format: Submit miscellaneous record submittals as PDF electronic file.

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

1.7 MAINTENANCE OF RECORD DOCUMENTS

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

B. Allowances: Furnish demonstration and training instruction time under the demonstration and training allowance as specified in Section 012100 "Allowances."

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For facilitator.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 CLOSEOUT SUBMITTALS

1. Transcript:
    a. Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
    b. Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
2. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance

manuals specified in Section 017823 "Operation and Maintenance Data."

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to

master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.
2. Documentation: Review the following items in detail:
    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.
5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

1.7 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017900

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes:

1. Demolition and removal of selected portions of exterior or interior of building or structure and site elements.
2. Removal and salvage of existing items for delivery to Owner and removal of existing items for reinstallation.

B. Related Requirements:

1. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
2. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.
3. Section 330500 "Common Work Results for Utilities" for removal of site utility systems piping, equipment, and components.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner as indicated.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage; prepare for reuse; and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.5 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.6 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials:

1. It is not expected that hazardous materials will be encountered in the Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Survey of Existing Conditions: Record existing conditions by use of , measured drawings.

1. Inventory and record the condition of items to be removed for salvage or reinstallation.

3.2 UTILITY SERVICES AND BUILDING SYSTEMS

A. Existing Services/Systems to Remain: Maintain utilities and building systems and equipment to remain and protect against damage during selective demolition operations.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utilities and building systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If disconnection of utilities and building systems will affect adjacent occupied parts of the building, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to those parts of the building.

3.3 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.4 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete:

1. Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Form-facing materials.

1.2 DEFINITIONS

A. Form-Facing Material: The temporary form materials that come in direct contact with the concrete as part of the formwork components in supporting the concrete while the concrete is setting and gaining sufficient strength to be self-supporting. The most common materials are steel, aluminum, and wood.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-in-Place Concrete, and as follows:

    a. Plywood, metal, or other approved panel materials.
    b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

        1) APA HDO (high-density overlay).
        2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
        3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
        4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. 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 produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class.

1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

2.3 RELATED MATERIALS

A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

B. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

C. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

D. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, 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.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-in-Place Concrete" for as-cast finishes.

C. Limit concrete surface irregularities as follows:

1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against

concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips
2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
2. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.
4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
    a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings.
    a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside

face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, in accordance with manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
3. Clean embedded items immediately prior to concrete placement.

3.3 REMOVING AND REUSING FORMS

A. 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 support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.

C. Prepare test and inspection reports.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Plain.

2.3 FABRICATING REINFORCEMENT

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

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.

G. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

3.3 JOINTS

A. 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. Do not continue reinforcement through sides of strip placements of floors and slabs.

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

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel-reinforcement placement.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete standards.
2. Concrete materials.
3. Admixtures.
4. Vapor retarders.
5. Curing materials.
6. Accessories.
7. Repair materials.
8. Concrete mixture materials.
9. Concrete mixture class types.
10. Concrete mixing.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement or blended hydraulic cement alone or in combination with one or more of the following:

1. Fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cementitious Materials (w/cm) Ratio: The ratio by weight of mixing water to cementitious materials.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Portland cement.
2. Blended hydraulic cement.
3. Performance-based hydraulic cement.
4. Fly ash.
5. Slag cement.
6. Silica fume.
7. Natural or other pozzolans.
8. Aggregates.
9. Ground calcium carbonate and aggregate mineral fillers.
10. Admixtures:

    a. Include limitations of use. Admixtures that do not comply with reference ASTM International requirements must be submitted with test data for approval.

11. Vapor retarders.
12. Curing materials.
13. Joint fillers.
14. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Compressive strength at 28 days or other age as specified.
3. Compressive strength required at stages of construction.
4. Durability exposure classes for Exposure Categories F, S, W, and C.
5. Maximum w/cm ratio.
6. Slump or slump flow limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Intended placement method.
10. Submit adjustments to design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant changes.

C. Concrete Schedule: For each location of each class of concrete indicated in "Concrete Mixture Class Types" Article, including the following:

1. Concrete class designation.
2. Location within Project.
3. Exposure class designation.
4. Formed surface finish designation and final finish.
5. Final finish for floors.
6. Floor treatment, if any.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following:

1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Floor and slab treatments.
6. Bonding agents.
7. Adhesives.
8. Vapor retarders.
9. Semirigid joint filler.
10. Joint-filler strips.
11. Repair materials.

B. Material Test Reports: For the following:

1. Portland cement.
2. Blended hydraulic cement.
3. Performance-based hydraulic cement.
4. Fly ash.
5. Slag cement.
6. Silica fume.
7. Natural or other pozzolans.
8. Aggregates.
9. Ground calcium carbonate and aggregate mineral filler.
10. Admixtures.

C. Preconstruction Test Reports: For each mix design.

1.5 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer's production facilities and delivery vehicles certified in accordance with NRMCA's certification requirements or equivalent approval by a State DOT.

1.6 PRECONSTRUCTION TESTING

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

1. Include the following information in each test report:

a. Admixture dosage rates.
b. Slump.
c. Air content.
d. Seven-day compressive strength.
e. 28-day compressive strength.
f. Evaluation of permeability-reducing admixtures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 as follows:

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When air temperature has fallen to, or is expected to fall below 40 deg F during the protection period, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE STANDARDS

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type II, gray.
2. Blended Hydraulic Cement: ASTM C595/C595M, Type IL, portland-limestone cement.
3. Pozzolans: ASTM C618, Class C, F, or N.
4. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

C. Normal-Weight Aggregates:

1. Coarse Aggregate: ASTM C33/C33M, Class 3M
2. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
3. Fine Aggregate: ASTM C33/C33M.

2.3 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260/C260M.

B. Chemical Admixtures: Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Admixtures with special properties, with documentation of claimed performance enhancement, ASTM C494/C494M, Type S.

C. Mixing Water for Concrete Mixtures and Water Used to Make Ice: ASTM C1602/C1602M. Include documentation of compliance with limits for alkalis, sulfates, chlorides, or solids content of mixing water from Table 2 in ASTM C1602/C1602M.

2.4 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A. Include manufacturer's recommended thickness and adhesive or pressure-sensitive tape.

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. ISI Building Products
    b. Poly-America, L.P.
    c. Reef Industries, Inc.
    d. W. R. Meadows, Inc.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50 deg F (10 deg C): Black.
b. Ambient Temperature between 50 and 85 deg F (10 and 29 deg C): Any color.
c. Ambient Temperature Above 85 deg F (29 deg C): White.

C. Water: Potable water that does not cause staining of the surface.

D. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

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. ChemMasters, Inc
b. Dayton Superior Corporation
c. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
d. SpecChem, LLC
e. W. R. Meadows, Inc

E. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

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. ChemMasters, Inc
b. Dayton Superior Corporation
c. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
d. SpecChem, LLC
e. W. R. Meadows, Inc

2.6 ACCESSORIES

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 in accordance with ASTM D2240.

C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.8 CONCRETE MIXTURE MATERIALS

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland or hydraulic cement in concrete assigned to Exposure Class F3 as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Slag Cement: 50 percent by mass.
3. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

2.9 CONCRETE MIXTURE CLASS TYPES

A. Class A: Normal-weight concrete used for footings, and foundation walls.
   1. Exposure Class: ACI 318Class F1.
   2. Minimum Compressive Strength: 3500 psi at 28 days.
   3. Maximum w/cm Ratio: 0.45.
   4. Slump Limit: 5 inches, plus or minus 1-1/2 inches for concrete.
   5. Air Content:
      a. Exposure Class F1: 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.

B. Class C: Normal-weight concrete used for interior slabs-on-ground.
   1. Exposure Class: ACI 318 Class F0.
   2. Minimum Compressive Strength: 4000 psi at 28 days.
   3. Maximum w/cm Ratio : 0.50.
   4. Slump Limit: 4 inches, plus or minus 1 inch for concrete.
   5. Air Content:
      a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

C. Class J: Normal-weight concrete used for exterior retaining walls.
   1. Exposure Class: ACI 318Class F2.
   2. Minimum Compressive Strength: 4000 psi at 28 days.
   3. Maximum w/cm Ratio: 0.50.
   4. Slump Limit: 5 inches, plus or minus 1.5 inches for concrete.
   5. Air Content:
      a. Exposure Classes F2 and F3: 6.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish delivery ticket.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Before placing concrete, verify that installation of concrete forms, accessories, reinforcement, and embedded items is complete and that required inspections have been performed.
   2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 TOLERANCES

A. Comply with ACI 117.

3.4 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install reglets to receive waterproofing and through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.5 INSTALLATION OF VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.
    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides and sealing to vapor retarder.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.6 INSTALLATION OF CAST-IN-PLACE CONCRETE

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

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Water addition in transit or at the Project site must be in accordance with ASTM C94/C94M and must not exceed the permitted amount indicated on the concrete delivery ticket.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

a. Do not use vibrators to transport concrete inside forms.
b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

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

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

3.7 INSTALLATION OF JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
2. Place joints perpendicular to main reinforcement.
    a. Continue reinforcement across construction joints unless otherwise indicated.
3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

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

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.8 APPLICATION OF FINISHING FLOORS AND SLABS

A. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfacesto receive mortar setting beds for bonded cementitious floor finishes.

B. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface. Use of an approved finishing aid is acceptable.
5. Do not apply troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
    a. Slabs on Ground:
        1) Specified overall values of flatness, FF 25; and of levelness, FL 20; with minimum local values of flatness, FF 17; and of levelness, FL 15.

D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

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

3.9 APPLICATION OF FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 (ACI 301M) Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
    a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
    b. Remove projections larger than 1 inch.
    c. Tie holes do not require patching.
    d. Surface Tolerance: ACI 117, Class D.
    e. Apply to concrete surfaces for metal lap pan deck formed surfaces and those surfaces that are buried or covered with subsequent installed surfaces.
2. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/4 inch.
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117, Class B.
    e. Locations: Apply to concrete surfaces to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
3. ACI 301 (ACI 301M) Surface Finish SF-3.0:
    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/8 inch.
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 Class A.
    e. Locations: Apply to concrete surfaces exposed to public view.

B. Rubbed Finish: Apply the following to as-cast surface finishes where indicated on Drawings:
1. Smooth-Rubbed Finish:
    a. Perform no later than one day after form removal.
    b. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
    c. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.
2. Grout-Cleaned Rubbed Finish:
    a. Clean concrete surfaces after contiguous surfaces are completed and accessible.
    b. Do not clean concrete surfaces as Work progresses.
    c. Mix 1 part portland cement to 1-1/2 parts fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
    d. Wet concrete surfaces.
    e. Scrub grout into voids and remove excess grout. When grout whitens, rub

surface with clean burlap, and keep surface damp by fog spray for at least 36 hours.

3.10 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling in:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to match color and texture with in-place construction exposed to view.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases6 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 3500 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.
    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.11 APPLICATION OF CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305R, before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.

2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period as follows:
    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
    e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
        1) Recoat areas subject to heavy rainfall within three hours after initial application.
        2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
1. Begin curing after finishing concrete.
2. Interior Concrete Floors:
    a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
        1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
            a) Lap edges and ends of absorptive cover not less than 12 inches.
            b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
        2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
            a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
            b) Cure for not less than seven days.
        3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following not in cold weather:
            a) Water.
            b) Continuous water-fog spray.

b. Floors To Receive Curing and Sealing Compound:

1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.12 INSTALLATION OF JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s).

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.13 INSTALLATION OF CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to meet specification requirements.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks in excess of 0.01 inch spalls, air bubbles exceeding surface finish limits, honeycombs, rock pockets, fins and other projections on the surface exceeding surface finish limits, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

a. Limit cut depth to 3/4 inch.
b. Make edges of cuts perpendicular to concrete surface.
c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
d. Fill and compact with patching mortar before bonding agent has dried.
e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
b. Compact mortar in place and match surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance, as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
   a. Correct low and high areas.
   b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by adding patching mortar.
   a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
   a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.
   a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
   b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
   a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
   b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
   c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
   d. Place, compact, and finish to blend with adjacent finished concrete.
   e. Cure in same manner as adjacent concrete.
8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
b. Dampen cleaned concrete surfaces and apply bonding agent.
c. Place patching mortar before bonding agent has dried.
d. Compact patching mortar and finish to match adjacent concrete.
e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

1. Testing agency to be responsible for providing curing facility for initial curing of strength test specimens on-site and verifying that test specimens are cured in accordance with standard curing requirements in ASTM C31/C31M.
2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results of fresh concrete, including slump or slump flow, air content, temperature and density.
13) Information on storage and curing of samples at the Project site, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

4. Provide a space and source of power or other resources for curing and access to test specimens by the testing agency.

B. Delivery Tickets: comply with ASTM C94/C94M.

C. Inspections:

1. Verification of use of required design mixture.
2. Concrete placement, including conveying and depositing.
3. Curing procedures and maintenance of curing temperature.
4. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 150 cu. yd. or fraction thereof.
    a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing is to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
    a. One test at point of delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    b. Perform additional tests as needed.
3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;.
    a. One test for each composite sample when strength test specimens are cast, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M:
    a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample when strength test specimens are cast.
5. Concrete Density: ASTM C138/C138M:
    a. One test for each composite sample when strength test specimens are cast.
6. Compression Test Specimens: ASTM C31/C31M:
    a. Cast and standard cure two sets of two 6 inches by 12-inches or 4-inch by 8-inch cylindrical specimens for each composite sample.
    b. Cast, and field cure two sets of two standard cylindrical specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M.
    a. Test one set of two standard cured specimens at seven days and one set of two specimens at 28 days.
    b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.

c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests of standard cured cylinders equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests:
    a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
        1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.7.6.3.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.15 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION 033000

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Masonry-joint reinforcement.
3. Miscellaneous masonry accessories.

B. Products Installed, but Not Furnished, under This Section:

1. Glass unit masonry in accordance with Section 042300 "Glass Unit Masonry" in concrete unit masonry.
2. Steel lintels and steel shelf angles in accordance with Section 055000 "Metal Fabrications" in concrete unit masonry.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

C. Exposed: Weather-exposed side of a constructed wall.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
3. Lintel design and types required.
4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Architectural CMUs, in the form of small-scale units.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.
    a. Include data on material properties.
    b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
2. Cementitious materials. Include name of manufacturer, brand name, and type.
3. Mortar admixtures.

4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
5. Grout mixes. Include description of type and proportions of ingredients.
6. Reinforcing bars.
7. Joint reinforcement.
8. Anchors, ties, and metal accessories.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

C. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined in accordance with TMS 402/602.

D. Weather Procedures:

1. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.
2. Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 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.

1.6 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 402/602.

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 402/602.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

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.

C. Source Limitations for Integral Water Repellent: Obtain integral water-repellent units from CMU and mortar manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Provide structuralunit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) in accordance with Tables 1 and 2 in TMS 402/602.
2. Determine net-area compressive strength of masonry by testing masonry prisms accordance with ASTM C1314.

B. Regulatory Requirements: Comply with the provisions of the following codes, specifications, and standards, except as otherwise shown or specified:

1. TMS 402/602:
    a. Maintain one copy of the standard in Project field office at all times during construction. Contractor's supervisory personnel are to be thoroughly familiar with this material as it applies to Project.

2.3 CONCRETE UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 402/602 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 ft. vertically and horizontally of a walking surface.

C. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners unless otherwise indicated.

2.4 CONCRETE MASONRY UNITS

A. Standard CMUs: Load-bearing ASTM C90 and Non-load-bearing ASTM C129.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of2150 psi.
2. Density Classification: Medium weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
4. Exposed Faces: Colored to match existing.

B. Architectural CMUs: Load bearing, ASTM C90 and Non-load bearing, ASTM C129.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of2150 psi.
2. Density Classification: Medium weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
4. Pattern and Texture:
    a. Standard pattern, split-face finish.
5. Colors: Match existing.
6. Special Aggregate: Provide units made with aggregate matching existing.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, 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 is not more than 0.1 percent when tested in accordance with ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Colored Cement Products: Packaged blend made from masonry cement or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
2. Pigments does not exceed 10 percent of portland cement by weight.
3. Pigments does not exceed 5 percent of masonry cement or mortar cement by weight.

E. Aggregate for Mortar: ASTM C144.

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.

F. Aggregate for Grout: ASTM C404.

G. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

B. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A951/A951M.

1. Interior Walls: Mill- galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Spacing of Cross Rods: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 ft..

2.7 TIES AND ANCHORS

A. General: Ties and anchors extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Mill-Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A641/A641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.

3. Galvanized-Steel Sheet: ASTM A653/A653M, Commercial Steel, G60 zinc coating.
4. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M commercial steel, with ASTM A153/A153M, Class B coating.
5. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

2.8 EMBEDDED FLASHING MATERIALS

A. Embedded Flashing Applications: Unless otherwise indicated, use the following:
   1. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
   2. 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.

B. Flexible Flashing:
   1. Flexible Flashing Fabrication:
      a. 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.
      b. Solder metal items at corners.

C. Solder and Sealants for Sheet Metal Flashings:
   1. Solder for Stainless Steel: ASTM B32, Grade Sn96, with acid flux of type recommended by stainless steel sheet manufacturer.

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.10 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use masonry cement or mortar cement mortar unless otherwise indicated.
   3. For exterior masonry, usemasonry cement or mortar cement mortar.

4. For reinforced masonry, usemasonry cement or mortar cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S.
3. For mortar parge coats, use Type S or Type N.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
5. For interior non-load-bearing partitions, Type O may be used instead of Type N.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments does not exceed 10 percent of portland cement by weight.
2. Pigments does not exceed 5 percent of masonry cement or mortar cement by weight.
3. Mix to match Architect's sample.
4. Application: Use pigmented mortar for exposed mortar joints with the following units:
    a. Architectural CMUs.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.
2. Application: Use colored-aggregate mortar for exposed mortar joints with the following units:
    a. Architectural CMUs.

F. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 402/602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured in accordance with ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

D. Exposed Masonry: Mix units to produce uniform blend of colors and textures.

E. Where existing masonry occurs, match coursing, bonding, color, and texture of existing masonry.

F. Temperature Control: Perform temperature-sensitive construction procedures while masonry Work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10 deg F.

1. 40 to 32 Deg F (4 to 0 Deg C):
    a. Mortar: Heat mixing water to produce mortar temperature between 40 and 120 deg F.
    b. Grout: Follow normal masonry procedures.
2. 32 to 25 Deg F (0 to Minus 4 Deg C):
    a. Mortar: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F; maintain temperature of mortar on boards above freezing.
    b. Grout: Heat grout materials to 90 deg F to produce in-place grout temperature of 70 deg F at end of workday.
3. 25 to 20 Deg F (Minus 4 to 7 Deg C):

a. Mortar: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F; maintain temperature of mortar on boards above freezing.
b. Grout: Heat grout materials to 90 deg F to produce in-place grout temperature of 70 deg F at end of workday.
c. Heat both sides of walls under construction using salamanders or other heat sources.
d. Use windbreaks or enclosures when wind is in excess of 15 mph.

4. 20 Deg F (Minus 7 Deg C) and Below:

a. Mortar: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F.
b. Grout: Heat grout materials to 90 deg F to produce in-place grout temperature of 70 deg F at end of workday.
c. Masonry Units: Heat masonry units so that they are above 20 deg F at time of laying.
d. Provide enclosure and auxiliary heat to maintain an air temperature of at least 40 deg F for 24 hours after laying units.

5. Do not heat water for mortar and grout to above 160 deg F.

G. Masonry Protection: Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.

1. 40 to 32 Deg F (4 to 0 Deg C): Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.
2. 32 to 25 Deg F (0 to Minus 4 Deg C): Completely cover masonry with weather-resistive membrane for at least 24 hours.
3. 25 to 20 Deg F (Minus 4 to 7 Deg C): Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.
4. 20 Deg F (Minus 7 Deg C) and Below: Except as otherwise indicated, maintain masonry temperature above 32 deg F (0 deg C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry, maintain heated enclosure to 40 deg F for 48 hours.

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 ft., 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 ft., 1/4 inch in 20 ft., or 1/2 inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., 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 ft., 1/4 inch in 20 ft., or 1/2 inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., 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 ft. or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:

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

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs. Patch at existing, joints to align to match existing patterns.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. 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.

G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Joint Sealants: Comply with ASTM C1193 for use of joint sealants, including acoustic sealants as applicable to materials, applications and Project conditions.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 CONTROL JOINTS

A. General: Install control joint materials in CMUs as masonry progresses. Do not allow materials to span control joints without provision to allow for in-plane wall or partition movement.

B. Locate control joints. Comply with NCMA TEK 10-02D.

C. Form control joints in CMUs as follows:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

3.7 LINTELS

A. Install lintels over openings as indicated.

B. Install loose steel over openings. See Drawings.

1. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.8 FLASHING

A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall 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 lintels, 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.
3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
4. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
5. 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.

3.9 REINFORCED UNIT MASONRY

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 402/602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 402/602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements is done at Contractor's expense.

B. Testing Prior to Construction: One set of tests.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Concrete Masonry Unit Test: For each type of unit provided, in accordance with ASTM C140 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.

F. Mortar Test (Property Specification): For each mix provided, in accordance with ASTM C780. Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.

H. Prism Test: For each type of construction provided, in accordance with ASTM C1314 at 7 days and at28 days.

I. Fire-Resistance Rated Construction: Where applicable, inspect fire-rated CMU construction to determine compliance with construction documents per building code compliance.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

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

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid-strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 08-04A.

3.12 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.

END OF SECTION 042200

SECTION 042300 - GLASS UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass block.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Fabrication and installation details for glass unit masonry, including vertical and horizontal coursing, anchors, reinforcement, and expansion strips. Include accessories where indicated.

C. Samples for Initial Selection: Manufacturer's actual glass-block units.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store glass block in unopened cartons on elevated platforms, under cover, and 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 glass-block grid materials in unopened cartons in an enclosed, dry location.

C. Store accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Proceed with installation of glass unit masonry assemblies only when ambient and material temperatures are 40 deg F or higher.

1. Maintain temperature in installation areas at 40 deg F or above for 48 hours after installing.
2. Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or when joint substrates are wet.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. For glass block, obtain glass block from single source from single manufacturer.

B. For accessory materials, obtain each cementitious material admixture and accessory component from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Glass-block grid systems, including attachment to building construction, to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Loads: As indicated on Drawings.

2.3 GLASS BLOCK

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Seves Glass Block, Inc.
2. Approved Equivalent

B. Glass Unit Masonry:

1. Sizes, General: Provide manufacturer's standard sizes unless indicated as custom.
2. Square Glass-Block Size: 7-3/4 inches square
3. Glass Unit Masonry Patterns: As selected by Architect from manufacturer's full range.
4. Glass Color: Colorless.

2.4 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II. Provide natural color or white cement as required to produce mortar color indicated.

1. Where joints are indicated to be raked out and pointed, gray cement may be used for setting mortar.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Aggregate: ASTM C144, with 100 percent passing No. 8 sieve.

1. For pointing mortar and joints narrower than 1/4 inch, use aggregate graded with 100 percent passing No. 16 sieve.
2. White Aggregates: Natural white sand or crushed white stone.
3. Colored Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Water: Potable.

2.5 GLASS UNIT MASONRY ACCESSORIES

A. Panel Reinforcement: Ladder-type units, butt welded, not lapped and welded; complying with ASTM A951/A951M in straight lengths of not less than 10 ft., and as

follows:

1. Exterior Walls: Hot-dip galvanized, carbon steel wire.
2. Wire Size: W1.7 or 0.148-inch diameter.
3. Width: 1-5/8 inches.
4. Spacing of Cross Rods: Not more than 16 inches apart.

B. Panel Anchors: Glass-block manufacturer's standard perforated steel strips, 0.0359 inch by 1-3/4 inches wide by 24 inches long, hot-dip galvanized after fabrication to comply with ASTM A153/A153M.

C. Fasteners, General: Unless otherwise indicated, provide Type 304 or Type 316 stainless steel fasteners at exterior walls and zinc-plated fasteners with coating complying with ASTM B633, Class Fe/Zn 5, at interior walls. Select fasteners for type, grade, and class required.

D. Asphalt Emulsion: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M or ASTM D1227/D1227M.

E. Sealants: Manufacturer's standard elastomeric sealants of base polymer that comply with applicable requirements in Section 079200 "Joint Sealants."

F. Sealant Accessories: Provide sealant accessories, including primers, bond-breaker tape, and cylindrical sealant backing, that comply with applicable requirements in Section 079200 "Joint Sealants."

2.6 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, or antifreeze compounds unless otherwise indicated.

1. Do not use calcium chloride in mortar.
2. For mortar in exterior panels, use water-repellent admixture in accordance with admixture manufacturer's written instructions.
3. For pointing mortar in exterior panels, use water-repellent admixture in accordance with admixture manufacturer's written instructions.
4. Limit cementitious materials in mortar to portland cement and lime.

B. Mortar for Glass Unit Masonry Assemblies:

1. Comply with ASTM C270, Proportion Specification for Type S mortar.
    a. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Mix mortar to produce a stiff but workable consistency that is drier than mortar for brick or concrete masonry. Discard mortar when it has reached initial set.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine sills, jambs, and heads surrounding glass unit masonry assemblies, 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 OF GLASS BLOCK WITH MORTAR

A. General: Install masonry units in accordance with manufacturer's written instructions.

1. Where applicable, fasten frames and anchors or clips securely to surrounding construction.
2. Shim starting track as needed to make it level.
3. Arrange coursing pattern to provide consistent joint work throughout.

B. Apply a heavy coat of asphalt emulsion to sill and adhere expansion strips to jambs and heads with asphalt emulsion. Allow asphalt emulsion to dry before placing mortar. Trim expansion strips to width required to fit glass block and to full lengths of heads and jambs.

C. Set glass block with completely filled bed and head joints, with no furrowing, accurately spaced and coordinated with other construction. Maintain 1/4-inch exposed joint widths unless otherwise indicated.

D. Install panel reinforcement in horizontal joints at spacing indicated and continuously from end to end of panels; comply with the following requirements:

1. Vertical Spacing of Panel Reinforcement for Exterior Panels: Every other course, but not more than 16 inches o.c., starting with first course above sill.
2. Do not bridge expansion joints with panel reinforcement.
3. Place panel reinforcement in joints immediately above and below all openings within glass unit masonry assemblies.
4. Lap panel reinforcement not less than 6 inches if more than one length is necessary.
5. Embed panel reinforcement in mortar bed by placing lower half of mortar bed first, pressing panel reinforcement into place, and covering with upper half of mortar bed.

E. Use rubber mallet to tap units into position. Do not use steel tools, and do not allow units to come into contact with metal accessories and frames.

F. Use plastic spacers in mortar joints to produce uniform joint widths and to prevent mortar from being squeezed out of joints.

G. Keep expansion joints free of mortar.

H. Clean glass unit masonry assemblies as work progresses. Remove mortar fins and smears immediately, using a clean, wet sponge or a scrub brush with stiff fiber bristles. Do not use harsh cleaners, acids, abrasives, steel wool, or wire brushes when removing mortar or cleaning glass unit masonry assemblies.

I. Install sealant at jambs, heads, mullions, and other locations indicated. Prepare joints, including installation of primer and bond-breaker tape or cylindrical sealant backing, and apply elastomeric sealants to comply with requirements in Section 079200 "Joint Sealants."

J. Construction Tolerances: Set glass block to comply with the following tolerances:

1. Variation in Mortar-Joint Thickness: Do not vary from joint thickness indicated by more than plus or minus 1/16 inch.
2. For faces of adjacent exposed units, do not vary from flush alignment by more than 1/16 inch.

3.3 CLEANING

A. On surfaces adjacent to glass unit masonry assemblies, remove mortar, sealants, and other residue resulting from glass-block installation, in a manner approved by manufacturers of materials involved.

B. Perform final cleaning of glass unit masonry assemblies when surface is not exposed to direct sunlight. Start at top of panel using generous amounts of clean water. Remove water with clean, dry, soft cloths; change cloths frequently to eliminate dried mortar particles and aggregate.

END OF SECTION 042300

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous framing and supports.
2. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
3. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Requirements:

1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. 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. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.
2. Loose steel lintels.

1.4 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

D. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.2 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

F. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

G. Post-Installed Anchors: chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, 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 F593, and nuts, ASTM F594.

2.3 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.

B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

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. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.4 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.

2.5 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.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.6 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 bearing and leveling plates.

C. Prime plates with zinc-rich primer.

2.7 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 one-twelfth of clear span, but not less than 8 inches unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.8 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.

2.9 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.10 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items 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.

D. Preparation for Shop Priming: Prepare surfaces to comply withrequirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF LOOSE BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
    a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood products.
2. Dimension lumber framing.
3. Miscellaneous lumber.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

D. Lumber grading agencies, and abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products 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

A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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. 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 wood products.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 15 percent.
2. Dimension Lumber: 19 percent unless otherwise indicated.

2.2 DIMENSION LUMBER FRAMING

A. Joists, Rafters, and Other Framing by Grade: Select Structural grade.

1. Species:

a. Hem-fir (north); NLGA.
b. Douglas fir-larch; WCLIB or WWPA.
c. Southern pine or mixed southern pine; SPIB.
d. Spruce-pine-fir; NLGA.
e. Douglas fir-south; WWPA.
f. Hem-fir; WCLIB or WWPA.
g. Douglas fir-larch (north); NLGA.
h. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.3 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.][any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Western woods; WCLIB or WWPA.
7. Northern species; NLGA.
8. Eastern softwoods; NeLMA.

C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods; No. 2 Common grade; NeLMA.
5. Northern species; No. 2 Common grade; NLGA.
6. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.

2.4 FASTENERS

A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

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 A153/A153M or ASTM F2329 or of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F1667.

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, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.

2.5 METAL FRAMING ANCHORS

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. MiTek Industries, Inc.
2. Simpson Strong-Tie Co., Inc.
3. Tamlyn
4. Approved equivalent.

B. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.

1. Width: 3/4 inch.
2. Thickness: 0.050 inch.
3. Length: 16 inches.

C. Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-1/2 inches wide by 0.050 inch thick. Tie fastens to side of rafter or truss, face of top plates, and side of stud below.

D. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.

1. Bolt Diameter: 5/8 inch.
2. Width: 2-1/2 inches.
3. Body Thickness: 0.108 inch.
4. Base Reinforcement Thickness: 0.108 inch.

E. Materials: Unless otherwise indicated, fabricate from the following materials:

1. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.
    a. Use for interior locations unless otherwise indicated.
2. Stainless steel bars and shapes complying with ASTM A276/A276M, Type 304.
    a. Use for exterior locations and where indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

D. Do not splice structural members between supports unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
    1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

F. Sort and select lumber so that natural characteristics 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.

G. 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.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
    1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).
    2. ICC-ES evaluation report for fastener.

I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without

splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

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 wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 INSTALLATION OF CEILING JOIST AND RAFTER FRAMING

A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

B. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

END OF SECTION 061000

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Butyl joint sealants.
6. Latex joint sealants.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Butyl joint sealants.
6. Latex joint sealants.

B. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

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.

1.3 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.

B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

2.4 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

2.5 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

2.6 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

2.7 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

2.8 JOINT-SEALANT BACKING

A. Sealant Backing Material: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, 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.

2.9 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following

requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    a. Concrete.
    b. Masonry.
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. 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 C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
    1. Do not leave gaps between ends of sealant backings.
    2. Do not stretch, twist, puncture, or tear sealant backings.
    3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used

between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants in accordance with 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 in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.
    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Exterior joints in vertical surfaces and horizontal nontraffic surfaces:

1. Joint Locations:
    a. Control and expansion joints in unit masonry.
    b. Joints between metal panels.
    c. Joints between different materials listed above.
    d. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
    e. Other joints as indicated on Drawings.
2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of

colors.

B. Interior joints in horizontal traffic surfaces:

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in tile flooring.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P, 25, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Interior joints in vertical surfaces and horizontal nontraffic surfaces:

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Tile control and expansion joints.
c. Vertical joints on exposed surfaces of unit masonry.
d. Joints on underside of exposed plant-precast structural concrete.
e. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement:

1. Joint Locations:

a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces:

1. Joint Locations:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Concealed mastics:

1. Joint Locations:

a. Aluminum thresholds.
b. Other joints as indicated on Drawings.

2. Joint Sealant: Butyl-rubber based.

END OF SECTION 079200

SECTION 084213 - ALUMINUM-FRAMED ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed entrance door systems.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Aluminum-framed entrance door systems.

B. Product Data Submittals: For each product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories.

C. Shop Drawings:

1. Plans, elevations, sections, full-size details, and attachments to other work.
2. Details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
3. Full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrance door systems, showing the following:
    a. Joinery, including concealed welds.
    b. Anchorage.
    c. Expansion provisions.
    d. Flashing and drainage.
4. Connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
5. Point-to-point wiring diagrams showing the following:
    a. Power requirements for each electrically operated door hardware.
    b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

D. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For aluminum-framed entrance door systems.

1.4 QUALITY ASSURANCE

A. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.5 WARRANTY

A. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
    a. Color fading more than 5 Delta E units when tested in accordance with ASTM D 2244.
    b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D 4214.
    c. Cracking, peeling, or chipping.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain all components of aluminum-framed entrance door systems, including framing and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrance door systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

C. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at 150 percent of positive and negative wind-load design pressures, entrance doors, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.

2. Test Durations: As required by design wind velocity, but not less than 10 seconds.

D. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas of entrance doors when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.

E. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):

a. Entrance Doors: U-factor of not more than 0.68 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.

2. Air Leakage:

a. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

F. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 ALUMINUM-FRAMED ENTRANCE DOOR SYSTEMS

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. EFCO Corporation
2. Kawneer Company, Inc.; Arconic Corporation
3. OldCastle BuildingEnvelope (OBE)
4. Tubelite Inc.
5. YKK AP America Inc.
6. Approved equivalent.

B. Entrance Doors (FRP)

1. Flush FRP doors shall be SL-17 as manufactured by Special Lite. No substitutions.
2. 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.
3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide non-removable glazing stops on outside of door.

C. Framing Members: Manufacturer's standard extruded aluminum, minimum 0.125 inch thick and reinforced as required to support imposed loads.

1. Nominal Size**:** 1-3/4 by 4-1/2 inches.
2. Exterior Framing Construction: Thermally improved.
3. Finish: Match door finish.

D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

F. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
    a. Sheet and Plate: ASTM B209.
    b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
    c. Structural Profiles: ASTM B308/B308M.
2. Steel Reinforcement:
    a. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
    b. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
    c. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
3. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.4 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

B. Weather Stripping: Manufacturer's standard replaceable components.

1. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.5 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads**,** fabricated from 300 series stainless steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

C. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At interior and exterior doors, provide compression weather stripping at fixed stops.

E. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At exterior doors, provide weather sweeps applied to door bottoms.

F. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

G. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOOR SYSTEMS

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

K. Install entrance doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

END OF SECTION 084213

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Mechanical and electrified door hardware
   2. Electronic access control system components

B. Section excludes:
   1. Windows
   2. Cabinets (casework), including locks in cabinets
   3. Signage
   4. Toilet accessories
   5. Overhead doors

C. Related Sections:
   1. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
   2. Division 06 Section "Rough Carpentry"
   3. Division 06 Section "Finish Carpentry"
   4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
   5. Division 08 Sections:
      a. "Metal Doors and Frames"
      b. "Flush Wood Doors"
      c. "Stile and Rail Wood Doors"
      d. "Interior Aluminum Doors and Frames"
      e. "Aluminum-Framed Entrances and Storefronts"
      f. "Stainless Steel Doors and Frames"
      g. "Special Function Doors"
      h. "Entrances"
   6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
   7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.2 REFERENCES

A. UL LLC
   1. UL 10B - Fire Test of Door Assemblies
   2. UL 10C - Positive Pressure Test of Fire Door Assemblies
   3. UL 1784 - Air Leakage Tests of Door Assemblies
   4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute
   1. Sequence and Format for the Hardware Schedule

2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association
1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute
1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
2. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
3. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
4. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.3 SUBMITTALS

A. General:
1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:
1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
   a. Wiring Diagrams: For power, signal, and control wiring and including:
      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

a. Samples will be returned to the supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:
   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   c. Indicate complete designations of each item required for each opening, include:
      1) Door Index: door number, heading number, and Architect's hardware set number.
      2) Quantity, type, style, function, size, and finish of each hardware item.
      3) Name and manufacturer of each item.
      4) Fastenings and other pertinent information.
      5) Location of each hardware set cross-referenced to indications on Drawings.
      6) Explanation of all abbreviations, symbols, and codes contained in schedule.
      7) Mounting locations for hardware.
      8) Door and frame sizes and materials.
      9) Degree of door swing and handing.
      10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
5. Key Schedule:
   a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
   b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
   f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
   a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
   b. Include warranties for specified door hardware.

D. Closeout Submittals:
1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
   a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Final approved hardware schedule edited to reflect conditions as installed.
   d. Final keying schedule
   e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
   f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:
1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
   a. Fire door assemblies, in compliance with NFPA 80.
   b. Required egress door assemblies, in compliance with NFPA 101.

1.4 QUALITY ASSURANCE

A. Qualifications and Responsibilities:
1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: 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 meets these requirements:
   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Architect and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.

d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:
1. Fire-Rated Door Openings:
a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
2. Smoke and Draft Control Door Assemblies:
a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
3. Electrified Door Hardware
a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
4. Accessibility Requirements:
a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings
1. Keying Conference
a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2) Preliminary key system schematic diagram.
3) Requirements for key control system.
4) Requirements for access control.
5) Address for delivery of keys.
2. Pre-installation Conference
a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Inspect and discuss preparatory work performed by other trades.
c. Inspect and discuss electrical roughing-in for electrified door hardware.
d. Review sequence of operation for each type of electrified door hardware.
e. Review required testing, inspecting, and certifying procedures.
f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:
   a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.6 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop 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.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.7 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    a. Mechanical Warranty
        1) Locks
            a) Schlage L Series: 10 years
        2) Closers
            a) LCN 4000 Series: 30 years

1.8 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 MATERIALS

A. Fabrication
1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
   1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:
   1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
   2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
   3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.3 CONTINUOUS HINGES

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives
   2. Acceptable Manufacturers:
      a. Best
      b. Hager

B. Requirements:
   1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
   2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
   3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
   4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
   5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
   6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
   7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.4 MORTISE LOCKS

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. Schlage L9000 series
   2. Acceptable Manufacturers and Products:
      a. Sargent 8200 series

b. Best 45H series

B. Requirements:
1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-3/5-inch x 3/5 inch with 180-degree visibility. Provide messages color-coded using ANSI Z535 Safety Red with full text and/or symbols, as scheduled, for easy visibility. When applicable allows for lock status indication on both sides of the door.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Provide motor based electrified locksets that comply with the following requirements:
   a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
   b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
   c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
   d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
   e. Connections – provide quick-connect Molex system standard.
8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

2.5 CYLINDERS

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product:
   a. Schlage Everest 29 R
2. Acceptable Manufacturers and Products:
   a. Best Preferred Patented
   b. Yale Keymark

B. Requirements:

1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
3. Patented Restricted Small Format: cylinder with small format interchangeable cores (SFIC) with restricted, patented keyway.
4. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
5. Nickel silver bottom pins.

2.6 KEYING

A. Scheduled System:
   1. Existing factory registered system:
      a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:
   1. Construction Keying:
      a. Replaceable Construction Cores.
         1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
            a) 3 construction control keys
            b) 12 construction change (day) keys.
         2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.
   2. Permanent Keying:
      a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
         1) Master Keying system as directed by the Owner.
      b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
      c. Provide keys with the following features:
         1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
         2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
      d. Identification:
         1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
         2) Identification stamping provisions must be approved by the Architect and Owner.
         3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and

embossed or stamped with “DO NOT DUPLICATE” along with the “PATENTED” or patent number to enforce the patent protection.
4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

e. Quantity: Furnish in the following quantities.
1) Permanent Control Keys: 3.
2) Master Keys: 6.
3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
4) Key Blanks: Quantity as determined in the keying meeting.

2.7 KEY CONTROL SYSTEM

A. Manufacturers:
1. Scheduled Manufacturer:
a. Telkee
2. Acceptable Manufacturers:
a. HPC
b. Lund

B. Requirements:
1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
b. Provide hinged-panel type cabinet for wall mounting.

2.8 DOOR CLOSERS

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product:
a. LCN 4040XP series
2. Acceptable Manufacturers and Products:
a. No Substitute
b. Corbin-Russwin DC8000 series
c. Sargent 281 series

B. Requirements:
1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.

3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
11. Closers shall be capable of being upgraded by adding modular mechanical or electronic components in the field.

2.9 DOOR TRIM

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives
   2. Acceptable Manufacturers:
      a. Burns
      b. Trimco

B. Requirements:
   1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

PROTECTION PLATES

C. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives
   2. Acceptable Manufacturers:
      a. Burns
      b. Trimco

D. Requirements:
   1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
   2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
   3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.10 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Zero International
   2. Acceptable Manufacturers:
      a. National Guard
      b. Reese

B. Requirements:
   1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
   2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
   3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
   4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.11 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:
   1. Hinges at Exterior Doors: BHMA 630 (US32D)
   2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
   3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
   4. Protection Plates: BHMA 630 (US32D)
   5. Overhead Stops and Holders: BHMA 630 (US32D)
   6. Door Closers: Powder Coat to Match
   7. Wall Stops: BHMA 630 (US32D)
   8. Latch Protectors: BHMA 630 (US32D)
   9. Weatherstripping: Clear Anodized Aluminum
   10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of hardware, 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. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
   2. Custom Steel Doors and Frames: HMMA 831.
   3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
   4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:
   1. Install construction cores to secure building and areas during construction period.

2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

N. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

P. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

R. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.3 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. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.4 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.5 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

120559 OPT0394110 Version 1

Hardware Group No. 001

For use on Door #(s):

04.1 05.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		628	IVE
1	EA	CLASSROOM DEAD LOCK	L9463BD		626	SCH
1	EA	SFIC EVEREST CORE	80-037 EV29 R		622	SCH
1	EA	SFIC CONST. CORE	80-035			SCH
1	EA	PUSH PLATE	8200 6" X 16"		630	IVE
1	EA	PULL PLATE	8303 10" 6" X 16"		630	IVE
1	EA	SURFACE CLOSER	4040XP SHCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	SET	GASKETING	429AA-S		AA	ZER
1	EA	DOOR SWEEP	8192AA		AA	ZER
1	EA	THRESHOLD	655A		A	ZER

END OF SECTION 087100

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for nonstructural wood framing and suspension systems that support gypsum board panels.

1.2 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.

1.3 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or 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, or 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 SOURCE LIMITATIONS

A. Obtain each type of gypsum panel and joint finishing material from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide panel products in maximum lengths and widths available that will minimize joints in each area and that correspond with support system specified or indicated on Drawings.

2.3 INTERIOR GYPSUM BOARD

A. Mold-Resistant Gypsum Board: ASTM C1396/C1396M; manufactured with moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch, Type X.
2. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
3. Long Edges: Tapered.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M requirements.

1. Mold-Resistant Joint Compound: Use mold-resistant formulations with mold-resistant panel products.

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 drying-type, all-purpose compound.
    a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.5 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C1002 unless otherwise specified or indicated on Drawings.

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 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840 requirements.

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. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Mold-Resistant Gypsum Board: At all locations.

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 on Drawings.
2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 APPLICATION OF JOINT TREATMENT MATERIALS

A. Finishing Panel Products: Treat joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare panel 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 panel joints, except for trim products specifically indicated as not intended to receive tape.

D. Interior Gypsum Board: Finish panels to levels indicated below and in accordance with ASTM C840:

1. 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 099123 "Interior Painting."

3.5 PROTECTION

A. Protect adjacent surfaces from joint compound and promptly remove from floors and other non-gypsum board surfaces. Repair surfaces stained, marred, or otherwise damaged during gypsum board installation and finishing.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoset-rubber base.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.4 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

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. Johnsonite; a Tarkett company
2. Approved equivalent.

B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:

a. Style B, Cove: Provide in all areas, unless noted otherwise.

C. Thickness: 0.125 inch.

D. Height: As indicated on Drawings.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Preformed.

G. Inside Corners: Job formed or preformed.

H. Colors: As indicated by manufacturer's designations.

2.2 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

C. Immediately before installation, sweep and vacuum clean substrates to be covered by

resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

    a. Miter or cope corners to minimize open joints.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 096513

SECTION 098433 - SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes shop-fabricated, sound-absorbing acoustical panel units tested for acoustical performance.

1.2 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

B. SAA: Sound Absorption Average.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include color, panel edge, core material, and mounting indicated.

B. Shop Drawings: For unit assembly and installation.

1. Include plans, elevations, sections, and mounting devices and details.
2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
3. Include details at cutouts and penetrations for other work.
4. Include direction of fabric weave and pattern matching.

C. Samples for Initial Selection: For each type of fabric facing.

1. Include Samples of hardware and accessories involving color or finish selection.

D. Samples for Verification: For the following products:

1. Panel Edge: 12-inch- long Sample(s) showing each edge profile, corner, and finish.
2. Core Material: 12-inch- square Sample at corner.
3. Mounting Devices: Full-size Samples.
4. Assembled Panels: Approximately 36 by 36 inches, including joints and mounting methods.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Electrical outlets, switches, and thermostats.
2. Items penetrating or covered by units including the following:

a. Lighting fixtures.

b. Air outlets and inlets.
c. Speakers.
d. Alarms.
e. Access panels.

3. Show operation of hinged and sliding components covered by or adjacent to units.

B. Product Certificates: For each type of unit.

C. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.7 FIELD CONDITIONS

A. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.

B. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication and indicate them on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to the following:
   a. Warping of panels.
2. Warranty Period: Thirty years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Units to comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting

agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.
2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested in accordance with NFPA 265 Method B Protocol or NFPA 286.

2.2 SOUND-ABSORBING WALL PANELS

A. Sound-Absorbing Wall Panels: Manufacturer’s standard panels construction consisting of facing material wood fiber board front face and edges and insulation core.
    1. Basis-of-Design Product: Subject to compliance with requirements, provide Tectum® Direct-Attached Wall or Ceiling Panels or comparable product by one of the following:
        a. Approved equivalent.

2.3 MATERIALS

A. Face Material:
    1. Composition: Aspen wood fibers bonded with inorganic hydraulic cement.
        a. Finish: Paint.
        b. Color: As selected from manufacturer’s standard colors.

B. Core Materials: Manufacturer's standard
    1. Glass-Fiber Board: ASTM C612; of type standard with manufacturer; nominal density of 6 to 7 lb/cu. Ft unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
    2. Mineral-Fiber Board: Maximum flame-spread and smoke-developed indexes of 25 and 10, respectively; minimum density of 13 lb/cu. ft., and with perforated surface.

C. Mounting Devices: Thru face of unit, recommended by manufacturer to support weight of unit, and as follows:
    1. Fasteners: Manufacturer's standard painted head screws.

2.4 FABRICATION

A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face and edges on dimensionally stable core.

B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.

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

3.2 INSTALLATION

A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb and Level: Plus or minus 1/16 inch in 48 inches, noncumulative.

3.4 CLEANING

A. Clean panels on completion of installation to remove dust and other foreign materials in accordance with manufacturer's written instructions.

END OF SECTION 098433

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Surface preparation of interior substrates and application of the following:

1. Primers.
2. Water-based finish coatings.

B. Related Requirements:

1. Section 099600 "High-Performance Coatings" for tile-like coatings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include preparation requirements and application instructions.
2. Indicate VOC content.

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat. Submit actual paint drawdowns as specified below for verification Samples.

1. Submit Samples on rigid backing, 8 inches square.
2. Label each coat of each Sample.
3. 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 applicable interior painting schedule articles to cross-reference paint systems specified in this Section. Include color designations.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.4 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 of less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each paint product from single source from single manufacturer.

2.2 INTERIOR PAINTS, GENERAL

A. Interior Paints: Subject to compliance with requirements, available products that may be incorporated into the Work include but are not limited to products listed in product types below and applicable interior painting schedule articles for the paint category indicated.

B. Material Compatibility:

1. Materials for use within each paint system must 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, provide products recommended in writing by topcoat manufacturer for use in paint system and on substrate indicated.

C. Colors: As indicated in a color schedule.

2.3 PRIMERS

A. Interior Latex Primer Sealer: Pigmented, water-based latex sealer; formulated to reduce porosity of substrate for finish coats; for use on new interior plaster, concrete, and gypsum board substrates. Not intended for use on wood or previously painted surfaces.

B. Interior, Latex Primer for Wood: Waterborne-emulsion primer formulated for resistance to extractive bleeding, mold, and microbials; for hiding stains; and for use on interior wood substrates.

C. Wood-Knot Sealer: White shellac or other sealer recommended in writing by manufacturer for this purpose.

2.4 WATER-BASED FINISH COATINGS

A. Interior Latex Paint: Pigmented, water-based coating for use on interior primed/sealed plaster and gypsum board, and on primed wood and metals.

1. Gloss and Sheen Level: Manufacturer's standard flat.

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. Wood: 15 percent.
2. Gypsum Board: 12 percent. Verify that finishing compound is dry and sanded smooth.

C. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers. 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 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.

3.3 APPLICATION OF INTERIOR PAINT PRODUCTS

A. Apply paints in accordance with manufacturer's written instructions.

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 the applicable interior painting schedule articles may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view in occupied spaces:
    a. Uninsulated metal piping.
    b. Uninsulated plastic piping.
    c. Pipe hangers and supports.
    d. Metal conduit.
    e. Plastic conduit.
    f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    g. Other items as directed by Architect.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 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. 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, apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.
3. Cost of retesting is Contractor's responsibility.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.

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, WOOD SUBSTRATES

A. Finish Carpentry Substrates: Wood trim.

1. Latex over Latex Primer System :

a. Prime Coat: Interior latex primer for wood.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior latex paint, flat.

3.7 INTERIOR PAINTING SCHEDULE, GYPSUM-BASED SUBSTRATES

A. Gypsum Board and Plaster Substrates:

1. Latex over Latex Sealer System :

a. Prime Coat: Interior latex primer sealer.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior latex paint, flat.

END OF SECTION 099123

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Block fillers.
2. Interior primers/sealers.
3. Metal primers.
4. Epoxy coatings.

B. Related Requirements:

1. Section 099123 "Interior Painting" for general field painting.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include preparation requirements and application instructions.
2. Indicate VOC content.

B. Samples for Verification: For each type of coating system and each color and gloss of topcoat. Submit actual paint drawdowns as specified below for verification Samples.

1. Submit Samples on actual substrate material to be coated, 8 inches square.
2. Label each coat of each Sample.
3. Label each Sample for location and application area.

C. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in High-Performance Coating Schedules. Include color designations and production runs (batch numbers).

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.4 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each coating system product from single source from single manufacturer.

2.2 HIGH-PERFORMANCE COATING PRODUCTS, GENERAL

A. High-Performance Coating Products: Subject to compliance with requirements, available products that may be incorporated into the Work include but are not limited to products listed in product types below and applicable exterior and interior high-performance coating schedule articles for the coating category indicated.

B. Material Compatibility:

1. Materials for use within each coating system must 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 coating system, provide products recommended in writing by topcoat manufacturer for use in system and on substrate indicated.

C. Colors: As selected by Architect from manufacturer's full range, unless indicated on drawings.

2.3 BLOCK FILLERS

A. Epoxy Block Filler: Solvent-based, two-component, epoxy, high-solids coating; formulated to bridge and fill porous surfaces of CMU substrates in preparation for specified subsequent coatings.

2.4 METAL PRIMERS

A. Epoxy Zinc-Rich Primer: Solvent-based, multi-component, epoxy-type anti-corrosive primer; formulated for use on cleaned ferrous metal substrates that will be exposed to moderate industrial or marine environments.

B. Epoxy, Anticorrosive Primer: Solvent-based, two-component, epoxy, anti-corrosive primer; formulated for use on ferrous and galvanized metal substrates.

2.5 EPOXY COATINGS

A. Epoxy: Solvent-based, two-component epoxy coating; formulated for resistance to incidental splash and spillage of dilute (5 percent) sulfuric acid, (15 percent) hydrochloric acid, (20 percent) sodium hydroxide, gasoline, and heavy-duty cleaners and detergents; for use on wall and floor surfaces in moderate-to-heavy-traffic commercial and moderate industrial environments.

1. Gloss Level: Manufacturer's standard gloss.

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. Masonry (Clay and CMUs): 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers. 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 applicable to substrates and coating systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing coating 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 coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.

E. 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.

F. Galvanized Metal Substrates: Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION OF HIGH-PERFORMANCE COATINGS

A. Apply coating system products in accordance with manufacturer's written instructions.

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written instructions, apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written instructions.
3. Cost of retesting is Contractor's responsibility.

3.5 CLEANING AND PROTECTION

A. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

B. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

C. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE, MASONRY SUBSTRATES

A. CMU Substrates:

1. Epoxy System for Wet Environments:

a. Block Filler: Epoxy block filler.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss.

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE, METAL SUBSTRATES

A. Steel Substrates:

1. Epoxy System:

a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss.

END OF SECTION 099600

SECTION 101423 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panel signs.

1.2 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Panel signs.

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 Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Product Schedule: For panel signs. Use same designations indicated on Drawings or specified.

1.4 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. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", the ABA standards of the Federal agency having jurisdiction, and ICC A117.1.

2.2 PANEL SIGNS

A. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Solid-Sheet Sign: Aluminum sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph and as follows:
    a. Thickness: Manufacturer's standard for size of sign.
    b. Surface-Applied, Raised Graphics: Applied characters and Braille
2. Sign-Panel Perimeter: Finish edges smooth.
    a. Edge Condition:
        1) Vertical Edges: Square cut.
        2) Horizontal Edges: Square cut.
    b. Corner Condition in Elevation: As indicated on Drawings.
3. Frame: Entire perimeter.
    a. Material: Aluminum.
    b. Finish and Color: As selected by Architect from manufacturer's full range.
4. Mounting: Surface mounted to wall with countersunk flathead through fasteners.
5. Surface Finish and Applied Graphics:
    a. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.
    b. Overcoat: Manufacturer's standard baked-on clear coating.
6. Text and Typeface: Accessible raised characters and Braille. Finish raised characters to contrast with background color, and finish Braille to match background color.
7. Flatness Tolerance: Sign is to 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.

2.3 PANEL-SIGN MATERIALS

A. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 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. Exposed Metal-Fastener Components, General:
    a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
    b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant Allen-head or spanner-head slots unless otherwise indicated.
4. Sign Mounting Fasteners:
    a. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.5 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.
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. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into indicated sign surface to produce precisely formed copy, incised to uniform depth.

1. Engraved Metal: Fill engraved graphics with manufacturer's standard baked enamel.

2.6 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.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

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. 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. 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.

4. 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. Accessible Signage: Install in locations on walls as indicated on Drawings and according to the accessibility standard.

C. Mounting Methods:

1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

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 102113.19 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments.

B. Related Requirements:

1. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

A. Coordinate requirements for blocking, reinforcing, and other supports concealed within wall to ensure that toilet compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Solid-plastic toilet compartments:

a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show overhead support or bracing locations.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment.

1. Include Samples of hardware and accessories involving material and color selection.

D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

E. Delegated Design Submittals: For grab bars mounted on toilet compartment panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For toilet compartments.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain plastic toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.

B. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:

1. Panels are able to withstand a concentrated load on grab bar of at least 250 lbf applied at any direction and at any point, without deformation of panel.

C. Regulatory Requirements: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1 for toilet compartments designated as accessible.

2.3 SOLID-PLASTIC TOILET COMPARTMENTS

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. ASI Global Partitions
2. Approved equivalent

B. Toilet-Enclosure Style: Overhead braced, privacy type.

C. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color throughout thickness of material. Provide with no-sightline system consisting of door and pilaster lapped edges on strike side of door and door and pilaster lapped edges on hinge side of door (unless continuous hinge is used).

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
2. Heat-Sink Strip: Manufacturer's continuous, extruded-aluminum or stainless steel strip fastened to exposed bottom edges of solid-plastic components to hinder

malicious combustion.

3. Color: One color in each room as indicated by manufacturer's designations.

D. Pilaster Shoes: Manufacturer's standard design; stainless steel.

E. Pilaster Sleeves (Caps): Manufacturer's standard design; stainless steel.

F. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum or stainless steel.

2.4 HARDWARE AND ACCESSORIES

A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories. Mount with through bolts.

1. Hinges: Provide one of the following:

a. Manufacturer's continuous, cam type that swings to a closed or partially open position or continuous, spring-loaded type, allowing emergency access by lifting door.

1) Material, Continuous Hinge: Aluminum or Stainless steel.

b. Manufacturer's integral hinge for solid-plastic doors, allowing emergency access by lifting door.

1) Material, Integral Hinge: Nylon gravity cam unit with stainless steel pins/screws.

2. Latch and Keeper: Manufacturer's surface-mounted latch unit, designed for emergency access, and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible.

a. Material: Aluminum or Stainless steel.

3. Coat Hook: Manufacturer's combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.

a. Material: Manufacturer's standard.

4. Door Bumper: Manufacturer's rubber-tipped bumper at outswinging doors.

a. Material: Manufacturer's standard.

5. Door Pull: Manufacturer's unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible.

a. Material: Manufacturer's standard.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless

steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.5 MATERIALS

A. Aluminum Castings: ASTM B26/B26M.

B. Aluminum Extrusions: ASTM B221.

C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

D. Stainless Steel Castings: ASTM A743/A743M.

E. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.6 FABRICATION

A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, swinging doors for standard toilet enclosures and 36-inch- wide, outswinging doors with a minimum 32-inch- wide, clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

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

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:
    a. Pilasters and Panels or Screens: 1/2 inch.
    b. Panels or Screens and Walls: 1 inch.
2. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height brackets.
    a. Locate bracket fasteners, so holes for wall anchors occur in masonry or tile joints.
    b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels and adjust, so tops of doors are parallel with overhead brace when doors are in closed position.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 102113.19

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.

B. Items provide by owner, but installed by contractor:

1. Items indicated on drawings.

1.2 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.

1.3 ACTION SUBMITTALS

A. Product Data: For each 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.

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 Submittals: For grab bars.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.4 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.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

A. Owner-Furnished Materials: As indicated on Drawings.

2.2 PERFORMANCE REQUIREMENTS

A. 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.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain each type of public-use washroom accessory from single source from single manufacturer.

B. Grab Bar:

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. OD: 1-1/2 inches.
4. Configuration and Length: As indicated on Drawings.

C. Mirror Unit:

1. Frame: Stainless steel angle, 0.05 inch thickixed tilt.
    a. Corners: Manufacturer's standard.
2. Size: As indicated on Drawings.
3. Hangers: Manufacturer's standard rigid, tamper and theft resistant.

2.4 MATERIALS

A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch- minimum nominal thickness unless otherwise indicated.

B. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

C. 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.

D. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.5 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 OF TOILET, BATH, AND LAUNDRY ACCESSORIES

A. Install accessories in accordance with 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 in accordance with manufacturer's written instructions.

END OF SECTION 102800

SECTION 260000 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Drawings and specifications.
2. Scope of work.
3. Codes, permits and inspections.
4. Interferences.
5. Materials and workmanship.
6. Acceptance.

1.2 DRAWINGS AND SPECIFICATIONS

A. The Civil, Architectural, Interiors, Structural, Mechanical, Electrical, and equipment drawings and specifications are hereby incorporated into and become a part of this Division. Contractor shall examine all such drawings and specifications and become thoroughly familiar with provisions contained herein and the submission of his bid shall be construed as indicating such knowledge.

B. Electrical drawings are in part diagrammatic, intending to convey scope of work, indicating general arrangement of panelboards, switches, equipment, conduit, outlets, and other devices. Due to the diagrammatic nature of the drawings, many of the necessary individual component parts are not indicated but shall be included by the Contractor for a complete and operable electrical system. Follow drawings in laying out work, and verify places for installation of materials and equipment. Whenever a question exists as to exact intended location of outlets or equipment, obtain instructions from the Engineer before proceeding with work. Information presented on these drawings is as accurate as preliminary surveys and planning can determine, but complete accuracy is not guaranteed, and Contractor field verification of all dimensions and conditions is required.

C. All changes from these drawings necessary to make the work conform to the building as constructed and to fit the work of other trades or to conform to the rules and regulations of the State, City, or Municipal bodies having jurisdiction, are to be made by electrical contractor, at his own expense.

D. The exact locations of apparatuses, fixtures, equipment and conduits shall be ascertained from the Owner or his representative in the field, and the work shall be laid out accordingly. Should the Contractor fail to ascertain such locations, the work shall be changed at his own expense when so ordered by the Owner. The Owner reserves the right to make minor changes in the location of conduit and equipment up to the time of installation, without additional cost.

1. Unless otherwise indicated, within industrial buildings, all conduit, cable tray and busway shall be routed at the elevation of the roof framing except where

individual drops are made to distribution equipment, utilization equipment, fixtures or devices.

E. The electrical drawings and specifications are intended to supplement each other and any material or labor called for in one shall be supplied even though not specifically mentioned in both. Labor and/or materials neither shown nor specified, but necessary for the completion and proper functioning of the system, shall be provided by Contractor.

F. Should conflicting information exist in the drawings and/or specifications, the better quality or greater quantity shall be provided when a clarification cannot be obtained.

1.3 SCOPE OF WORK

A. Supply all labor and material to complete all electrical work shown on the drawings, specified herein or required to complete the construction of the building as shown.

B. The listing of article or material, operation or method, requires that the Contractor shall provide and install, unless noted to be supplied by others, each item listed of quality or subject to qualification noted. Each operation shall be performed according to standard practice, manufacturer's instructions and conditions stated, providing all necessary labor, equipment and incidentals.

C. Responsibility: the electrical contractor shall be responsible for the work of all his sub-contractors and the materials of all his suppliers. Include all materials, labor, and equipment required for a complete and working installation. Do not supply materials that will not work in the particular situation of this project.

1.4 CODES, PERMITS AND INSPECTIONS

A. Install all work in full accord with codes, rules and regulations of Municipal, City, County, State and Public Utilities and all other authorities having jurisdiction over the premises. This shall include all requirements of the City Building Code, regulations of the State Department of Industrial Relations, MIOSHA and the requirements of the National Electrical Code, as interpreted by the Local Inspection Division. All these codes, rules, and regulations are hereby incorporated into this specification.

B. Drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the above standards.

C. Wiring methods used shall be suitable for the installation and use in conformity with the provisions of the National Electric Code. Listed or labeled equipment shall be used or installed in accordance with any instructions included in the listing or labeling.

D. Comply with specification requirements which are in excess of code requirements and not in conflict with same.

E. The Contractor shall secure all permits and certificates of inspection incidental to his work, required by the foregoing authorities. All such certificates shall be delivered to

the Owner in duplicate, before final payment on contract will be allowed. The Contractor shall pay all fees, charges and other expenses in connection therewith.

1.5 INTERFERENCES

A. Before installing any of this work, the Contractor shall see that it does not interfere with clearances for the erection of finish beams, columns, pilasters, walls, ducts, and other structural, mechanical, or architectural members as shown on the drawings. If any work is so installed and later the architectural design cannot be followed, electrical contractor shall, at his own expense, make such changes in his work as the Architect or Engineer may direct to permit the completion of the other work in accordance with the drawings and specifications.

B. It shall be the duty of the Contractor to report any interferences between his work and that of any other Contractor to the Engineer as soon as they are discovered. The Engineer will determine which equipment shall be relocated regardless of which was first installed.

1.6 MATERIALS AND WORKMANSHIP

A. All work shall be installed in a practical and workmanlike manner by competent workers, skilled in their branch of the trade.

B. Unless expressly specified or indicated on the drawings to the contrary, all materials shall be new and free from defects and shall be the best of their several kinds.

C. Where materials, equipment and fixtures are recessed in fire rated walls, ceilings, soffits or floors, provide the necessary fire rated covers or box construction to maintain the fire rating.

D. During installation and construction, enclosures, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of foreign matter; and be vacuum cleaned both inside and outside before testing and operating and repainting if required.

E. During the construction operation and at its completion, the Contractor shall remove all debris and excess materials caused by his work and he shall leave the area of the operation broom clean.

1.7 ACCEPTANCE

A. As a precedent to requesting a final inspection, submit written statements regarding the following:

1. All work required by contract is completed.
2. All tests required by these specifications have been performed. Include a dated copy of all test results signed by the persons performing the test and the witnesses of the test.
3. The Owner's Representative has been instructed in the operation and maintenance of the electrical systems. This shall include training by

Manufacturer's Representatives as well as by the installers. Indicate the date of the instructions and the names of the Owner's representative.

4. Certificates of inspections from authorities having jurisdiction.
5. Spare items and parts as called for in specifications, to the Owner, obtain a written receipt and supply a copy of these receipts to the Engineer.
6. Written warranty and first years' service. Provide extended warranty where applicable.
7. A listing of the various Electrical Trades, their equipment suppliers, etc., including each firm's contact name, telephone number, emergency telephone number, etc. to the Owner for use during building warranty period.
8. Copies of "Receipts from the Owner" for all "Spare" items turned over to him.
9. A complete set of record "as built" drawings including all addenda and change orders as well as all changes required in the field.
10. Required operating and maintenance instructions and wiring diagrams on all equipment and systems to the Owner's operating personnel.

PART 2 - PRODUCTS – NOT USED
PART 3 - EXECUTION – NOT USED

END OF SECTION 260000

SECTION 260501 - MINOR ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 - EXECUTION

3.1 PERFORMANCE REQUIREMENTS

A. Refer to Section 024119 “Selective Demolition.”

3.2 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation and existing record documents.

D. Report discrepancies to Architect/Engineer before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

3.3 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Where concrete slabs are shown to be sawcut and removed, verify locations of conduits in or under the slab using x-ray or other method.

3.4 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, all existing electrical installations, except where shown to be reused. Coordinate to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors that remain, and patch surfaces.

D. Disconnect all existing outlets and remove devices, unless noted otherwise. Remove abandoned outlets if conduit servicing them is abandoned and removed.

E. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

F. Repair adjacent construction and finishes damaged during demolition and extension work.

G. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

H. Extend existing installations using materials and methods as specified.

END OF SECTION 260501

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire.
2. Metal-clad cable, Type MC.
3. Connectors and splices.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

D. Conductor Insulation:

1. Type THHN and Type THWN-2. Comply with UL 83 unless otherwise indicated as Type XHHW-2. Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. Conductor and Cable Marking: Comply with wire and cable marking according to

UL's "Wire and Cable Marking and Application Guide."

C. Circuits:

1. Single circuit.

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Ground Conductor: Bare.

F. Conductor Insulation:

1. Type TFN/THHN/THWN-2. Comply with UL 83 unless otherwise indicated as Type XHHW-2. Comply with UL 44.

G. Armor: Steel, interlocked.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: Two hole with long barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:

1. Copper:

a. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

D. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION, GENERAL

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points in accordance with Section 260533.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. For service and feeder circuits #1/0 AWG and larger, perform each of the following visual and electrical tests:
    a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    b. Inspect for correct identification.
    c. Inspect cable jacket and condition.
    d. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration.
    e. Continuity test on each conductor and cable.

B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.
4. Grounding and bonding hubs.
5. Grounding and bonding connectors.
6. Grounding and bonding busbars.
7. Grounding (earthing) electrodes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Field quality-control reports.

1) Include recommended testing intervals.

1.3 SERVICE CONDITIONS FOR ELECTRICAL EQUIPMENT

A. Soil Resistivity: Grounding (earthing) Work on the Project must account for soil resistivity conditions specified in Section 018116 "Facility Environmental Requirements."

B. Electrical and ICT Equipment Grounding (Earthing): Do not exceed 5 Ω resistance to ground (earth).

1. Contact Architect for resolution if 5 Ω specified resistance to ground (earth) is not attained after complying with prescriptive requirements in Article 250 of NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 GROUNDING AND BONDING CONDUCTORS

A. Equipment Grounding Conductor:

1. Standard Features: 600 V, THHN/THWN-2 copper wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. ASTM - Bare Copper Grounding and Bonding Conductor:

1. Standard Features: Complying with one or more of the following:

a. Soft or Annealed Copper Wire: ASTM B3.
b. Concentric-Lay Stranded Copper Conductor: ASTM B8.

2.3 GROUNDING AND BONDING CLAMPS

A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications.

B. UL KDER and KDSH - U-Bolt-Type Pipe and Rod Grounding and Bonding Clamp:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

2. Standard Features:

a. Listed for outdoor use.

C. UL KDER - Beam Grounding and Bonding Clamp:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

2. Standard Features: Mechanical-type, terminal, ground wire access from four directions; with dual, tin-plated or silicon bronze bolts.

D. UL KDER - Exothermically Welded Connection:

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. ABB, Electrification Business.
b. Crouse-Hinds; brand of Eaton, Electrical Sector.
c. ERICO; brand of nVent Electrical PLC.

2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

3. Standard Features: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING AND BONDING BUSHINGS

A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.

B. UL KDER - Bonding Bushing:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

2. Standard Features: Threaded bushing with insulated throat.

C. UL KDER - Grounding Bushing:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

2. Standard Features: Threaded bushing with insulated throat and mechanical-type wire terminal.

2.5 GROUNDING AND BONDING HUBS

A. UL KDER - Grounding and Bonding Hub:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

2. Standard Features: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

2.6 GROUNDING AND BONDING CONNECTORS

A. UL KDER - Pressure-Type Grounding and Bonding Busbar Cable Connector:

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the

following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

3. Standard Features: Copper or copper alloy, for compression bonding of one or more conductor directly to copper busbar. Listed for direct burial.

B. UL KDER - Crimped Lug Pressure-Type Grounding and Bonding Busbar Terminal:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

2. Standard Features: Cast silicon bronze, solderless compression-type wire terminals; with long barrel and two holes spaced on 5/8 or 1 inch centers for two-bolt connection to busbar.

C. UL KDER - Split-Bolt Service-Post Pressure-Type Grounding and Bonding Busbar Terminal:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

2. Standard Features: Bolts that surround cable and bond to cable under compression when nut is tightened after assembly is screwed into busbar opening.

D. UL KDER - Crimped Pressure-Type Grounding and Bonding Cable Connector:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

2. Standard Features: Crimp-and-compress connectors that bond to conductor when connector is compressed around conductor.

a. Copper or copper alloy, C and H shaped.

E. UL KDER - Split-Bolt Pressure-Type Grounding and Bonding Cable Connector:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing

laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

2. Standard Features: Bolts that surround cable and bond to cable under compression when nut is tightened.

a. Copper or copper alloy.

2.7 GROUNDING AND BONDING BUSBARS

A. Description: Miscellaneous grounding and bonding devices that serve as common connection for multiple grounding and bonding conductors.

B. UL KDER - Equipment Room Grounding and Bonding Busbar:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

2. Standard Features:

a. Bus: Rectangular bar of annealed copper.
b. Mounting Stand-Off Insulators: Lexan or PVC.

1) Comply with UL 891 for use in 600 V switchboards, impulse tested at 5000 V.

3. Other Available Features Required by the Project:

a. Dimensions: 1/4 by 4 inch in cross section; 24 inch length unless otherwise indicated on the Drawings.
b. Predrilled Hole Pattern: 9/32 inch holes spaced 1-1/8 inch apart suitable for installing specified grounding and bonding connectors.
c. Mounting Hardware: Stand-off brackets that provide 2 inch clearance to access rear of bus. Brackets and bolts must be stainless steel.

2.8 GROUNDING (EARTHING) ELECTRODES

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

2. Standard Features: Copper-clad steel; 3/4 inch by 10 ft.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine facility's grounding electrode system and equipment grounding for compliance

with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.

B. Inspect test results of grounding system measured at point of electrical service equipment connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS

A. Grounding and Bonding Conductors:

1. Provide solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.
2. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
3. Underground Grounding Conductors: Install bare copper conductor, 2/0 AWG unless otherwise indicated.

B. Grounding and Bonding Connectors:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

C. Grounding and Bonding Busbars: Provide in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated on the Drawings.

3.3 SELECTION OF GROUNDING AND BONDING PRODUCTS FOR COMMUNICATIONS

A. Comply with Section 270528 "Pathways for Communications Systems" and Section 271100 "Communications Equipment Room Fittings."

3.4 INSTALLATION OF GROUNDING AND BONDING

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Maintenance: NFPA 70B.
3. Electrical Safety: NFPA 70E.
4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
5. Communications Work: BICSI N1.

6. Work in ITE Rooms: NFPA 75.
7. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Grounding and Bonding Conductors:
   a. Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
   b. Underground Grounding Conductors:
      1) Bury at least 30 inches below grade.
2. Grounding and Bonding Connectors: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
   a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
   b. Make connections with clean, bare metal at points of contact.
   c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
   d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
   e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
   f. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
      1) Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate adjacent parts.
      2) Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
      3) Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.
   g. Grounding and Bonding for Piping:
      1) Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
      2) Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with bolted connector.
   h. Grounding for Steel Building Structure: Install driven ground rod at base of

each corner column and at intermediate exterior columns at distances not more than 60 ft apart.

3. Grounding and Bonding Busbars:
    a. Install busbar horizontally, on insulated spacers 2 inch minimum from wall, 6 inch above finished floor unless otherwise indicated.
    b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.
4. Electrodes:
    a. Ground Rods: Drive rods until tops are 2 inch below finished floor or final grade unless otherwise indicated.
        1) Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
        2) Use exothermic welds for below-grade connections.
    b. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode conductor.
    c. Concrete-Encased Electrode (Ufer Ground):
        1) Fabricate in accordance with NFPA 70; use minimum of 20 ft of bare copper conductor not smaller than 4 AWG.
            a) If concrete foundation is less than 20 ft long, coil excess conductor within base of foundation.
            b) Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
        2) Fabricate in accordance with NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 ft long. If reinforcing is in multiple pieces, connect together by usual steel tie wires or exothermic welding to create required length.
5. Grounding at Service:
    a. Equipment grounding conductors and grounding electrode conductors must be connected to ground busbar. Install main bonding jumper between neutral and ground buses.
6. Equipment Grounding and Bonding:
    a. Install insulated equipment grounding conductors with feeders and branch circuits.
    b. Poles Supporting Outdoor Lighting Fixtures: Bond insulated equipment grounding conductor to equipment grounding terminal inside pole base.

3.5 FIELD QUALITY CONTROL FOR GROUNDING AND BONDING

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench in accordance with manufacturer's published instructions.
3. Test completed grounding system at facility ground bus or service disconnect enclosure grounding terminal.
    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method in accordance with IEEE Std 81.
    c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

B. Nonconforming Work:

1. Grounding system will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective components and retest.

C. Collect, assemble, and submit test and inspection reports.

1. Report measured ground resistances that exceed 5 Ω the following values:

3.6 PROTECTION

A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Support systems.
2. Mounting, anchoring, and attachment components.
3. Installation of fabricated metal supports.
4. Installation of concrete bases.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    a. Slotted support systems, hardware, and accessories.
2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.

PART 2 - PRODUCTS

2.1 SUPPORT SYSTEMS

A. Steel Slotted Support Systems:

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. ABB, Electrification Business.
    b. Atkore Unistrut.
    c. Cooper B-line; brand of Eaton, Electrical Sector.
    d. G-Strut.
2. Standard Features: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.
    a. Referenced Standard: MFMA-4 factory-fabricated components for field assembly.
    b. Material for Channel, Fittings, and Accessories: Galvanized steel.

c. Channel Width: 1-5/8 inch.
d. For exterior and damp or wet locations: Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
e. For interior dry locations: Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

B. Conduit and Cable Support Devices:

1. Standard Features: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit:

1. Standard Features: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints:

1. Standard Features: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

2.2 MOUNTING, ANCHORING, AND ATTACHMENT COMPONENTS

A. Mechanical-Expansion Anchors:

1. Standard Features: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

B. Concrete Inserts:

1. Standard Features: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.

C. Clamps for Attachment to Steel Structural Elements:

1. Standard Features: MSS SP-58 units are suitable for attached structural element.

D. Through Bolts:

1. Standard Features: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.

E. Toggle Bolts:

1. Standard Features: All steel springhead type.

F. Hanger Rods:

1. Standard Features: Threaded steel.

PART 3 - EXECUTION

3.1 SELECTION OF HANGERS AND SUPPORTS

A. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT and ERMC as required by NFPA 70. Minimum rod size must be 1/4 inch in diameter.

B. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps or single-bolt conduit clamps.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Hot Work: NFPA 51B.
3. Installation of Steel Conduit: NECA NEIS 101.
4. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Raceway Support Methods: In addition to methods described in NECA NEIS 1, EMT and ERMC may be supported by openings through structure members, in accordance with NFPA 70.
2. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus 200 lb.
3. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
    a. To Wood: Fasten with lag screws or through bolts.
    b. To New Concrete: Bolt to concrete inserts.
    c. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
    d. To Existing Concrete: Expansion anchor fasteners.
    e. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
    f. To Light Steel: Sheet metal screws.
    g. Items Mounted on Hollow Walls and Nonstructural Building Surfaces:

Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

4. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

D. Interfaces with Other Work:

1. Touchup Finishes:

a. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1) Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

b. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
c. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

2. Installation of Fabricated Metal Supports:

a. Provide site-fabricated metal supports.
b. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
c. Field Welding: Comply with AWS D1.1/D1.1M. Submit welding certificates.

3. Installation of Concrete Bases:

a. Provide concrete bases of dimensions indicated, but not less than 4 inch larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
b. Use 3000 psi, 28-day compressive-strength concrete.
c. Anchor equipment to concrete base as follows:

1) Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2) Install anchor bolts to elevations required for proper attachment to supported equipment.
3) Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION 260529

SECTION 260533.13 - CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type EMT duct raceways and elbows.
2. Type ERMC duct raceways, elbows, couplings, and nipples.
3. Type FMC duct raceways.
4. Type LFMC duct raceways.
5. Type PVC duct raceways and fittings.
6. Fittings for conduit, tubing, and cable.
7. Joint compounds.
8. Solvent cements.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" specifies firestopping referenced by this Section.
2. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" specifies nonmetallic underground conduit with conductors (Type NUCC).
3. Section 260529 "Hangers and Supports for Electrical Systems" specifies conduit hangers and supports referenced by this Section.
4. Section 260543 "Underground Ducts and Raceways for Electrical Systems" specifies exterior duct banks, and underground utility construction.
5. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels.

1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Raceway Types:

1. EMT: Electrical metallic tubing.
2. ERMC: Electrical rigid metal conduit.
3. ERMC-S: Steel electrical rigid metal conduit.
4. FMC: Flexible metal conduit.
5. LFMC: Liquidtight flexible metal conduit.
6. PVC: Rigid PVC conduit.
7. PVC-40: Schedule 40 rigid PVC conduit.
8. PVC-80: Schedule 80 rigid PVC Conduit.
9. RMC: See ERMC.

B. Definitions:

1. Conduit: A structure containing one or more duct raceways.
2. Direct Buried: Installed underground without encasement in concrete or other protective material.
3. Duct Bank: An arrangement of conduit providing one or more continuous duct

raceways between two points.

4. Duct Raceway: A single enclosed raceway for conductors or cable.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

B. <**Insert additional performance requirements for the Project**>.

2.2 TYPE EMT DUCT RACEWAYS AND ELBOWS

A. UL FJMX - Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. UL CCN FJMX; including UL 797.
2. Standard Features:
    a. Material: Steel.
    b. Exterior Coating: Zinc.
    c. Interior Coating: Zinc with organic top coating.
    d. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.3 TYPE ERMC DUCT RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. UL DYIX - Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. UL CCN DYIX; including UL 6.
2. Standard Features:
    a. Exterior Coating: Zinc.
    b. Interior Coating: Zinc with organic top coating.
    c. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.4 TYPE FMC DUCT RACEWAYS

A. UL DXUZ - Steel Flexible Metal Conduit (FMC-S):

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. UL CCN DXUZ; including UL 1.
2. Standard Features:
    a. Material: Steel.
    b. Minimum Trade Size: Metric designator 16 (trade size 1/2).

2.5 TYPE LFMC DUCT RACEWAYS

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. UL CCN DXHR; including UL 360.
2. Standard Features:
    a. Material: Steel.
    b. Minimum Trade Size: Metric designator 16 (trade size 1/2).
3. Sustainable Design Features:

2.6 TYPE PVC DUCT RACEWAYS AND FITTINGS

A. UL DZYR - Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. UL CCN DZYR; including UL 651.
2. Standard Features:
    a. Dimensional Specifications: Schedule 40.
    b. Minimum Trade Size: Metric designator 21 (trade size 3/4).
    c. Markings: For use with maximum 90 deg C wire.

B. UL DZYR - Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. UL CCN DZYR; including UL 651.
2. Standard Features:
    a. Dimensional Specifications: Schedule 80.
    b. Minimum Trade Size:Metric designator 21 (trade size 3/4).
    c. Markings: For use with maximum 90 deg C wire.

2.7 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. UL DWTT - Fittings for Type ERMC and Type PVC Duct Raceways:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

    a. UL CCN DWTT; including UL 514B.

2. Standard Features:

    a. Material: [Steel][Die cast].
    b. Coupling Method: Threaded for ERMC; solvent welded for PVC.
    c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

B. UL FKAV - Fittings for Type EMT Duct Raceways:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

    a. UL CCN FKAV; including UL 514B.

2. Standard Features:

    a. Material: Steel.
    b. Coupling Method: Compression coupling or setscrew coupling. Setscrew couplings with only single screw per conduit are unacceptable.
    c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

C. UL ILNR - Fittings for Type FMC Duct Raceways:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

    a. UL CCN ILNR; including UL 514B.

D. UL DXAS - Fittings for Type LFMC Duct Raceways:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

    a. UL CCN DXAS; including UL 514B.

2.8 JOINT COMPOUNDS

A. UL FOIZ - Electrically Conductive Corrosion-Resistant Compound for Threaded Conduit.

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

    a. UL CCN FOIZ; including UL Subject 2419.

2.9 SOLVENT CEMENTS

A. UL VBEW - Solvent Cements for Nonmetallic Duct Raceways and Fittings:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Solvent Cements: UL CCN VBEW; including UL 340.
b. Solvent Cement Compatibility with PVC Conduit Fittings: UL CCN DWTT; including UL 514B. Follow solvent manufacturer's published instructions.
c. Solvent Cement Compatibility with Rigid PVC Conduit: UL CCN DZYR; including UL 651. Follow solvent manufacturer's published instructions.

PART 3 - EXECUTION

3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Unless more stringent requirements are specified in the Contract Documents or manufacturer's published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.

B. Outdoors:

1. Exposed: ERMC.
2. Concealed Aboveground: EMT.
3. Buried: PVC-40 unless otherwise indicated as PVC-80.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

C. Indoors:

1. Exposed and Subject to Physical Damage: ERMC.
2. Exposed and Not Subject to Physical Damage: EMT.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Damp or Wet Locations: Corrosion-resistant EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC in damp or wet locations, otherwise FMC.

D. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC: Provide threaded-type fittings unless otherwise indicated.

3.2 INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS

1.
2. Electrical Safety: NFPA 70E.
3. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
4. Life Safety and Means of Egress Work: NFPA 101.
5. Type EMT-S: Article 358 of NFPA 70 and NECA NEIS 101.
6. Type ERMC-S: Article 344 of NFPA 70 and NECA NEIS 101.
7. Type FMC-S: Article 348 of NFPA 70 and NECA NEIS 101.
8. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
9. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
10. Expansion Fittings: NEMA FB 2.40.
11. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. General Requirements for Installation of Duct Raceways:

a. Complete duct raceway installation before starting conductor installation.
b. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.
c. Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inch of changes in direction.
d. Make bends in duct raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
e. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
f. Support conduit within 12 inch of enclosures to which attached.
g. Install duct sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed duct raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install duct sealing fittings in accordance with NFPA 70.
h. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
i. Keep duct raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal duct raceway runs above water and steam piping.
j. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
k. Install pull wires in empty duct raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground duct raceways designated as spare above grade alongside duct raceways in use.
l. Install duct raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.

1) Termination fittings with shoulders do not require two locknuts.

m. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

2. Type ERMC:

a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of duct raceway and fittings before making up joints. Follow compound manufacturer's published instructions.

3. Types FMC and LFMC:

a. Provide a maximum of 36 inches of flexible conduit for recessed and semirecessed luminaires**,** equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

4. Types PVC, HDPE, and EPEC:

a. Comply with manufacturer's published instructions for solvent welding and fittings.
b. Join joints with solvent cement in accordance with manufacturer's published instructions and allowed to cure before handling. Joints to be bent, pushed, or pulled must set for minimum 24 h after joining.

5. Duct Raceways Embedded in Slabs:

a. Run duct raceways larger than metric designator 27 (trade size 1) below concrete slab][Run duct raceways larger than metric designator 27 (trade size) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place duct raceway close to slab support. Secure duct raceways to reinforcement at maximum 10 ft intervals.
b. Arrange duct raceways to cross building expansion joints with expansion fittings at right angles to the joint.
c. Arrange duct raceways to ensure that each is surrounded by minimum of 2 inches of concrete without voids.
d. Do not embed threadless fittings in concrete unless locations have been specifically approved by Architect.

6. Duct Raceway Terminations at Locations Subject to Moisture or Vibration:

a. Provide insulating bushings to protect conductors, including conductors smaller than 4 AWG.
b. EMT: Provide setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
c. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

7. Expansion-Joint Fittings:

a. Install expansion fittings at locations where conduits cross building or

structure expansion joints.

b. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's published instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

D. Interfaces with Other Work:

1. Firestop penetrations of fire-rated floor and wall assemblies.
2. Provide conduit hangers and supports.
3. Coordinate installation of new products for athletic field lighting with existing conditions.

3.3 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533.13

SECTION 260533.16 - BOXES AND COVERS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Junction boxes and pull boxes.
3. Cover plates for device boxes.
4. Hoods for outlet boxes.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" specifies materials and methods for sealing penetrations of rated walls and partitions referenced by this Section.
2. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding referenced by this Section.
3. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.

1.2 DEFINITIONS

A. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.

B. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:

1. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
2. Concrete Box: A box intended for use in poured concrete.
3. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
4. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
5. Cover Plate: A cover designed for protecting wiring devices installed in flush-mounted device boxes while permitting their safe operation; also called a faceplate or wallplate.
6. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
7. Device Box: A box with provisions for mounting a wiring device directly to the box.
8. Extension Ring: A ring intended to extend the sides of an outlet box or device

box to increase the box depth, volume, or both.

9. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
10. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
11. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
12. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
13. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
14. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.

C. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.

D. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. UL QCIT - Metallic Outlet Boxes and Covers:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. UL CCN QCIT; including UL 514A.
2. Standard Features:

a. Box having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
b. Material: Sheet steel.
c. Sheet Metal Depth: Minimum 1.5 inches.

B. UL QCIT - Metallic Conduit Bodies:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN QCIT; including UL 514A.

2. Standard Features: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.

C. UL QCIT - Metallic Device Boxes:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN QCIT; including UL 514A.

2. Standard Features:

a. Box with provisions for mounting wiring device directly to box.
b. Material: Sheet steel.
c. Sheet Metal Depth: minimum 1.5 inches.

2.3 JUNCTION BOXES AND PULL BOXES

A. UL BGUZ - Indoor Sheet Metal Junction and Pull Boxes:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN BGUZ; including UL 50 and UL 50E.

2. Standard Features:

a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
b. Degree of Protection: Type 1 unless otherwise indicated.

B. UL BGUZ - Indoor Cast-Metal Junction and Pull Boxes:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN BGUZ; including UL 50 and UL 50E.

2. Standard Features:
    a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
    b. Degree of Protection: Type 1 unless otherwise indicated or required.

C. UL BGUZ - Outdoor Sheet Metal Junction and Pull Boxes:
1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. UL CCN BGUZ; including UL 50 and UL 50E.
2. Standard Features:
    a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
    b. Degree of Protection: Type 3R unless otherwise indicted as Type 4 or Type 4X.

D. UL BGUZ - Outdoor Cast-Metal Junction and Pull Boxes:
1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. UL CCN BGUZ; including UL 50 and UL 50E.
2. Standard Features:
    a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
    b. Degree of Protection: Type 3R unless otherwise indicated as Type 4 or Type 4X.

2.4 COVER PLATES FOR DEVICE BOXES

A. UL QCIT or QCMZ - Metallic Cover Plates for Device Boxes:
1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. UL CCN QCIT or UL CCN QCMZ; including UL 514D.
2. Standard Features:
    a. Cover plate-Securing Screws: Metal with head color to match cover plate finish.
    b. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
    c. Cover Plate Material: 0.032 inch thick, Type 302/304 non-magnetic stainless steel with brushed finish.

2.5 HOODS FOR OUTLET BOXES

A. UL QCIT or QCMZ - Hoods for Outlet Boxes:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. UL CCN QCIT or UL CCN QCMZ; including UL 514D.
    b. Receptacle, Hood, Cover Plate, Gaskets, and Seals: UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.
2. Standard Features:
    a. Mounts to box using fasteners different from wiring device.
    b. Provides weatherproof, "while-in-use" cover.

PART 3 - EXECUTION

3.1 SELECTION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.

B. Degree of Protection:

1. Outdoors:
    a. Type 3R unless otherwise indicated as Type 4 or Type 4X.
2. Indoors:
    a. Type 1 unless otherwise indicated.
    b. Damp or Dusty Locations: Type 12.
    c. In Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
    d. Locations Exposed to Hosedown: Type 4.

3.2 INSTALLATION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
4. Outlet, Device, Pull, and Junction Boxes: Article 314 of NFPA 70.
5. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
2. Mount boxes at heights indicated on Drawings.
3. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
4. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
5. Locate boxes so that cover or plate will not span different building finishes.
6. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
7. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
8. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
9. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.

3.3 CLEANING

A. Remove construction dust and debris from boxes before installing cover plates, covers, and hoods.

3.4 PROTECTION

A. After installation, protect boxes from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260533.16

SECTION 260533.23 - SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Surface metal raceways and fittings.
2. Wireways and auxiliary gutters.

B. Related Requirements:

1. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding referenced by this Section.
2. Section 260553 "Identification for Electrical Systems" specifies warning signs referenced by this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 SURFACE METAL RACEWAYS AND FITTINGS

A. UL RJBT - Surface Metal Raceways and Fittings with Metal Covers:

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. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    b. MonoSystems, Inc.
    c. Wiremold; Legrand North America, LLC.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. UL CCN RJBT; including UL 5.
3. Standard Features:
    a. Galvanized steel base with snap-on covers.
    b. Manufacturer's standard enamel finish in color selected by Architect. Prime

coated, ready for field painting.

c. Wiring Channels: Single or Dual as indicated or required. Multiple channels must be capable of housing a standard 20 to 30 A device flush within the raceway.

2.3 WIREWAYS AND AUXILIARY GUTTERS

A. Source Quality Control:

1. Samples:

a. Nonmetallic Wireway and Auxiliary Gutter Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type, [**12 inch**]<**Insert dimension**> long.

B. UL ZOYX - Metal Wireways and Auxiliary Gutters:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN ZOYX; including UL 870.

2. Standard Features:

a. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
b. Finish: Manufacturer's standard enamel finish.
c. Wireway Covers: Screw-cover type unless otherwise indicated.

3. Other Available Features Required by the Project:

a. Degree of Protection: Type 1 for indoor use; Type 3R for outdoor use; unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
4. Auxiliary Gutters: Article 366 of NFPA 70.
5. Surface Metal Raceway: Article 386 of NFPA 70.
6. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Install surface raceways only where indicated on Drawings.
2. Install surface raceway with a minimum 2 inch radius control at bend points.
3. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inch and with no less than two supports per straight raceway section. Support surface raceway in accordance with manufacturer's published instructions. Tape and glue are unacceptable support methods.

3.2 CLEANING

A. Remove construction dust and debris from surface raceways before installing covers.

3.3 PROTECTION

A. After installation, protect surface raceways from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260533.23

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type PVC raceways and fittings.
2. Solvent cements.
3. Handholes and boxes for exterior underground wiring.

B. Related Requirements:

1. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" specifies nonmetallic underground conduit with conductors (Type NUCC).
2. Section 260553 "Identification for Electrical Systems" specifies underground-line warning tape and concrete cable routing markers (warning planks).

1.2 ALTERNATES

A. See Section 012300 "Alternates" for description of alternates affecting items specified in this Section.

1.3 DEFINITIONS

A. Duct: A single raceway or multiple raceways, installed singly or as components of a duct bank.

B. Duct Bank: Two or more ducts installed in parallel, direct buried or with additional casing materials such as concrete.

C. Handhole: An underground chamber containing electrical cables, sized such that personnel are not required to enter to access the cables.

D. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Precast or Factory-Fabricated Concrete Structures:
    a. Include plans, elevations, sections, and details, including attachments to other Work.
    b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.

c. Include reinforcement details.
d. Include frame and cover design and manhole chimneys.
e. Include grounding details.
f. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, sumps, and other accessories.
g. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.
c. Include cover design.
d. Include grounding details.
e. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and other accessories.

C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 TYPE ERMC-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 6 and UL CCN DYIX.

2.2 TYPE PVC RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 651 and UL CCN DZYR.

B. Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Dimensional Specifications: Schedule 40 or 80 as specified or indicated.
2. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Markings: For use with maximum 90 deg C wire.

2.3 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

2.4 SOLVENT CEMENTS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL CCN DWTT.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics:
    a. ASTM C858 for design and manufacturing processes.
    b. SCTE 77.

B. Precast Concrete Handholes and Boxes:

1. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover must form top of enclosure and must have load rating consistent with that of handhole or box.
2. 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. Advance Concrete Products Co.
    b. Oldcastle Infrastructure Inc.; CRH Americas
    c. Utility Concrete Products, LLC
3. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
4. Frame and Cover:
    a. Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
    b. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
    c. Cover Legend: Molded lettering, "ELECTRIC".
    d. Provide with grade adjustment rings as required.
5. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
    a. Type and size: Match fittings to duct to be terminated.
    b. Fittings must align with elevations of approaching duct and be located near interior corners of handholes to facilitate racking of cable.
    c. Provide minimum of one cast end-bell or duct-terminating fitting of each size provided in each wall.

C. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover:

1. Description: Molded of sand, concrete, and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or combination.
2. 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. NewBasis.
    b. Oldcastle Infrastructure Inc.; CRH Americas.
    c. Quazite; brand of Hubbell Utility Solutions; Hubbell Incorporated.
3. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and installed location.
    a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
    b. Cover Legend: Molded lettering, "ELECTRIC".
5. Options:
    a. Color: Gray.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of duct, duct bank, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in field. Notify Architect if there is conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.

3.2 SELECTION OF UNDERGROUND DUCTS

A. Duct for Electrical Feeders 600 V and Less: PVC-40 unless otherwise indicated as PVC-80, direct buried unless otherwise indicated.

B. Stub-ups: Concrete encased, PVC unless otherwise indicated as ERMC-S.

3.3 SELECTION OF UNDERGROUND ENCLOSURES

A. Handholes and Boxes:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete, AASHTO HB 17, H-20 structural load rating.

2. Units in Driveway, Parking Lot, Sidewalk and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20. Polymer concrete, SCTE 77, Tier 15.
3. Cover design load must not exceed load rating of handhole or box.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restoration: Restore area after construction vehicle traffic in immediate area is complete.

C. Restore surface features at areas disturbed by excavation and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."

E. Cut and patch existing pavement in path of underground duct, duct bank, and underground structures in accordance with "Cutting and Patching" Article in Section 017300 "Execution."

3.5 INSTALLATION OF DUCTS AND DUCT BANKS

A. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA TCB 2 for installation of underground ducts and duct banks.
2. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:

1. Curves and Bends:
    a. Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with minimum radius of 48 inch, both horizontally and vertically, at other locations unless otherwise indicated.
    b. Field bending must be in accordance with NFPA 70 minimum radii requirements, except bends over 45 degrees must be made with minimum radius of 48 inch. Use only equipment specifically designed for material and size involved. Use PVC heating bender for bending PVC conduit.
2. Joints: Use solvent-cemented joints in nonmetallic duct and fittings and make watertight in accordance with manufacturer's published instructions. Stagger couplings so those of adjacent duct do not lie in same plane. Couple steel conduits to ducts with adapters designed for this purpose.

a. Install insulated grounding bushings on steel raceway terminations that are less than 12 inches below grade or floor level and do not terminate in hubs.

3. End Bell Entrances to Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inch o.c. for 5 inch duct, and vary proportionately for other duct sizes.
   a. Begin change from regular spacing to end-bell spacing 10 ft from end bell, without reducing duct slope and without forming trap in line.
   b. Grout end bells into structure walls from both sides to provide watertight entrances.
4. Duct Terminators for Entrances to Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inch o.c. for 4 inch duct, and vary proportionately for other duct sizes.
   a. Begin change from regular spacing to terminator spacing 10 ft from terminator, without reducing duct line slope and without forming trap in line.
5. Building Wall Penetrations: Make transition from underground duct to steel raceway at least 10 ft outside building wall, without reducing duct line slope away from building and without forming trap in line. Use fittings manufactured for transition to steel raceway type installed.
6. Install manufactured steel raceway elbows for stub-ups at poles unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
   a. Couple steel elbows to ducts with adapters designed for this purpose.
7. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15 psig hydrostatic pressure.
8. Pulling Cord: Install 200 lbf test nylon cord in empty ducts.

3.6 INSTALLATION OF CONCRETE HANDHOLES, AND BOXES

A. Reference Standards:
   1. Precast Concrete Handholes: Comply with ASTM C891 unless otherwise indicated.
   2. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:
   1. Precast Concrete Handholes and Manholes:
      a. Install units level and plumb and with orientation and depth coordinated with connecting duct to minimize bends and deflections required for proper entrances.
      b. Unless otherwise indicated, support units on level bed of crushed stone or gravel graded from 1 inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
      c. Field-cut openings for conduits in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

2. Elevations:
    a. Manhole Roof: Install with rooftop at least 15 inch below finished grade.
    b. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch above finished grade.
    c. Install handholes with bottom below frost line below grade.
    d. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
    e. Where indicated, cast handhole cover frame integrally with handhole structure.

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Special Techniques:
1. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
2. Unless otherwise indicated, support units on level bed of crushed stone or gravel, graded from 1/2 inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
3. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.
4. Install handholes and boxes with bottom below frost line, below grade.
5. Field cut openings for duct in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
6. For enclosures installed in paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour concrete ring encircling, and in contact with enclosure entry, and with top surface screeded to top of box cover frame. Bottom of ring must rest on compacted earth.
    a. Concrete: 3000 psi, 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with troweled finish.
    b. Dimensions: 10 inch wide by 12 inch deep.

3.8 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump, and building interiors affected by Work.
1. Remove foreign material.

END OF SECTION 260543

SECTION 260546 - POLES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lighting standards.
2. Lighting standard accessories.
3. Utility pole accessories.

B. Related Requirements:

1. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding components referenced by this Section.
2. Section 260529 "Hangers and Supports for Electrical Systems" specifies hangers and supports referenced by this Section.
3. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs referenced by this Section.

1.2 DEFINITIONS

A. EPA: Equivalent projected area.

B. Grounding (Earthing): Electrically connecting, whether intentional or accidental, an electrical circuit or equipment to the earth, or to some conducting body that serves in place of the earth.

C. Lighting Standard: An upright pole or beam used to support luminaires and used as a raceway to enclose supply conductors. Lighting standards frequently include provisions for supporting and supplying decorative items such as holiday decorations, flags, or banners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on construction details, profiles, EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
2. Include finishes for lighting poles and luminaire-supporting devices.
3. Anchor bolts.
4. Include manufacturer's sample extended warranty language.

1.4 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store poles on decay-resistant skids at least 12 inch above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

B. Retain factory-applied pole wrappings on metal poles until immediately before pole installation. Handle poles with web fabric straps.

1.6 WARRANTY

A. Special Manufacturer Extended Warranty: Manufacturer warrants that pole(s) perform in accordance with specified requirements and agrees to provide repair or replacement of products that fail to perform as specified within extended-warranty period, including materials that corrode, fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period. Warranty must convey to Owner upon acceptance of the Work.

1. Extended-Warranty Period: Five years from date of Substantial Completion; prorated coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Criteria:

1. Regulatory Requirements:

a. Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. General Characteristics:

a. Basic Wind Speed: 90 mile/h.
b. Wind Importance Factor: 1.0.
c. Minimum Design Life: 25 years.
d. Velocity Conversion Factor: 1.0.
e. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless steel fasteners and mounting bolts unless otherwise indicated.
f. General Finish Requirements:

1) Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
2) 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.

2.2 LIGHTING STANDARDS

A. Steel Lighting Standard:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer(s) indicated on the Drawings.
2. Source Limitations: Obtain lighting standards from single manufacturer or producer.
3. Standard Features:

   a. Comply with requirements in Article 410 of NFPA 70 for luminaire supports.
   b. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless steel fasteners and mounting bolts unless otherwise indicated.
   c. General Finish Requirements:

      1) Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
      2) Appearance of the 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.

   d. Carbon Steel Poles: Comply with ASTM A500/A500M, Grade B carbon steel with a minimum yield of 46,000 psig; one-piece construction up to 40 ft in height with access handhole in lighting standard wall.

      1) Shape: Round, tapered.
      2) Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

   e. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to lighting standard top.
   f. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, listed for attaching grounding and bonding conductors of type and size indicated, and accessible through handhole.
   g. Handhole: Oval shaped, with minimum clear opening of 2-1/2-by-5 inch, with cover secured by stainless steel captive screws.
   h. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported load multiplied by a 5.0 safety factor.
   i. Powder-Coat Finish: Comply with NAAMM/NOMMA AMP 500 recommendations for applying and designating finishes.

      1) Surface Preparation: Clean surfaces in accordance with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair powder-coat bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, in accordance with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
      2) Powder Coat: Comply with AAMA 2604.

         a) Electrostatic-applied powder coating; single application and cured to a minimum 2.5 to 3.5 mil dry film thickness. Coat

interior and exterior of lighting standard for equal corrosion protection.

b) Color: As indicated on the Drawings.

4. Other Available Features Required by the Project:

a. Fasteners: Stainless steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.

1) Materials: Compatible with lighting standards as well as the substrates to which lighting standards are fastened and may not cause galvanic action at contact points.

2) Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

2.3 LIGHTING STANDARD ACCESSORIES

A. Base Covers: Manufacturers' standard metal units, finished same as pole, and arranged to cover pole's mounting bolts and nuts.

B. Mounting Hardware:

1. Anchor Bolts: Manufactured to ASTM F1554, Grade 55, with a minimum yield strength of 55,000 psi.

a. Galvanizing: Hot-dip galvanized in accordance with ASTM A153/A153M, Class C.

b. Bent or Headed rods in diameter and length as recommended by the manufacturer.

c. Threading: Uniform National Coarse, Class 2A.

2. Nuts: ASTM A563/A563M, Grade A, Heavy-Hex.

a. Galvanizing: Hot-dip galvanized in accordance with ASTM A153/A153M, Class C.

b. Four nuts provided per anchor bolt**,** shipped with nuts preassembled to the anchor bolts.

3. Washers: ASTM F436/F436M, Type 1.

a. Galvanizing: Hot-dip galvanized in accordance with ASTM A153/A153M, Class C.

b. Two washer(s) provided per anchor bolt.

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. Examine poles, luminaire-mounting devices, lowering devices, and pole accessories before installation. Components that are scratched, dented, marred, wet, moisture damaged, or visibly damaged are considered defective.

C. Examine roughing-in for foundation and conduit to verify actual locations of installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF FOUNDATIONS FOR POLES AND LIGHTING STANDARDS

A. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Structural steel complying with ASTM A36/A36M and hot-dip galvanized in accordance with ASTM A123/A123M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Anchor Bolts: Install plumb using manufacturer-supplied template, uniformly spaced.

3.3 INSTALLATION OF LIGHTING STANDARDS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturers' published instructions, comply with the following:

1. Electrical Construction: NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Hot Work: NFPA 51B.
4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
5. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Alignment: Align foundations and lighting standards for optimum directional alignment of luminaires and their mounting provisions on lighting standards.
2. Concrete Lighting Standard Foundations: Set anchor bolts in accordance with anchor-bolt templates furnished by manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."
3. Foundation-Mounted Lighting Standards: Mount lighting standards with leveling nuts and tighten top nuts to torque level in accordance with manufacturer's published instructions.
    a. Grout void between lighting standard base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
    b. Install base covers unless otherwise indicated.
    c. Use a short piece of 1/2 inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of lighting standard.
4. Lighting Standards and Foundations Set in Concrete-Paved Areas: Install lighting standards with a minimum 6-inch wide, unpaved gap between the lighting standard or foundation and the edge of the adjacent concrete slab. Fill unpaved ring with pea gravel. Insert material to a level 1 inch below top of concrete slab.
5. Raise and set lighting standard using web fabric slings (not chain or cable) at

locations indicated by manufacturer.

6. Corrosion Prevention:
    a. Steel Conduits: Comply with requirements in Section 260533.13 "Conduits for Electrical Systems." In concrete foundations, wrap conduit with 0.010 inch thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

D. Interfaces with Other Work:
    1. Grounding and Bonding: Bond metallic components of lighting standards and support structures as follows:
        a. Provide insulated equipment grounding conductors with supply feeders for bonding luminaires and other pole-mounted electrical or electronic equipment to ground terminals of their supplying power sources in accordance with Article 250 of NFPA 70.
        b. Bond metallic components of luminaires, pole accessories, and foundation to insulated equipment grounding conductor.
    2. Identification: Provide labels for lighting standards, components, wiring, cabling, terminals, and associated electrical equipment.
        a. Identify field-installed conductors, interconnecting wiring, and components.
        b. Label each enclosure with engraved metal or laminated-plastic nameplate.
        c. Provide warning signs and arc-flash hazard warning labels for electrical equipment.

END OF SECTION 260546

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Cable ties.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 LABELS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN PGDQ2 for components; including UL 969.

B. UL PGDQ2 - Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

C. UL PGDQ2 - Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather-, and chemical-resistant; self-laminating, with protective shield over legend. Size labels such that clear shield overlaps entire printed legend.
2. Marker for Labels:

a. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. UL PGDQ2 - Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 3-1/2 by 5 inches for equipment.

2.2 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil thick by 1 to 2 inch wide; compounded for outdoor use.

C. Underground-Line Warning Tape:

1. Tape:
    a. Recommended by manufacturer for method of installation and suitable to identify and locate underground electrical [**and communications**]utility lines.
    b. Printing on tape must be permanent and may not be damaged by burial operations.
    c. Tape material and ink must be chemically inert and not be subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
2. Color and Printing:
    a. Comply with APWA Uniform Color Code using NEMA Z535.1 safety colors.
    b. Inscriptions for Red Tapes: "CAUTION BURIED ELECTRIC LINE BELOW".
3. Nonconducting Line-Warning Tape :
    a. Pigmented polyolefin, bright colored, continuous-printed on one side with inscription of utility**,** compounded for direct-burial service.
    b. Width: 3 inch.
    c. Thickness: 4 mil.
    d. Weight: 18.5 lb/1000 sq. ft.
    e. Tensile in accordance with ASTM D882: 30 lbf and 2500 psi.

2.3 CABLE TIES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN ZODZ; including UL 1565 or UL 62275.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. UL ZODZ - UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

A. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.

1. Color must be factory applied or field applied for sizes larger than 6 AWG when permitted by authorities having jurisdiction.
2. Colors for 208Y/120 V Circuits:
    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.
3. Colors for 240 V Circuits:
    a. Phase A: Black.
    b. Phase B: Red.
4. Colors for 480Y/277 V Circuits:
    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.
5. Color for Neutral (Grounded Conductor): White or gray.
6. Color for Equipment Ground: Green.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Locations of Underground Lines: Underground-line warning tape for power and lighting.

D. Cover Plates: Label individual cover plates with self-adhesive labels. Place label at top of cover plate. Label cover plate with the following information, in the order listed:

1. Panelboard designation.
2. Colon or dash.
3. Branch circuit number.

E. Equipment Identification Labels:

1. Black letters on white field.
2. Indoor Equipment: Self-adhesive label or laminated acrylic or melamine plastic sign.
3. Outdoor Equipment: Laminated acrylic or melamine sign.
4. Equipment to Be Labeled:

   a. Panelboards: Typewritten directory of circuits in location provided by panelboard manufacturer. Panelboard identification must be in form of self-adhesive, engraved**,** laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Transformers: Label that includes tag designation indicated on Drawings for transformer, feeder, and panelboards or equipment supplied by secondary.
   e. Enclosed switches.
   f. Enclosed circuit breakers.
   g. Enclosed controllers.
   h. Variable-speed controllers.
   i. Push-button stations.
   j. Contactors.
   k. Battery-inverter units.

F. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 SELECTION OF SIGNS AND HAZARD MARKINGS

A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.

B. Signs, labels, and tags required for personnel safety must comply with the following standards:

1. Safety Colors: NEMA Z535.1.
2. Facility Safety Signs: NEMA Z535.2.
3. Safety Symbols: NEMA Z535.3.
4. Product Safety Signs and Labels: NEMA Z535.4.
5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.

3.4 INSTALLATION

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Thermal Movements: Allow for thermal movements from ambient and surface

temperature changes typical for electrical equipment environments specified in Section 018116 "Facility Environmental Requirements" and Section 260010 "Supplemental Requirements for Electrical."

C. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.

D. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

E. Install identifying devices before installing acoustical ceilings and similar concealment.

F. Verify identity of item before installing identification products.

G. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

H. Apply identification devices to surfaces that require finish after completing finish work.

I. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.

K. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.

L. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.

M. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.

N. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

O. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape not less than 12 inch directly above cables or raceways buried 18 inch or more

below grade. Use multiple tapes where width of multiple lines installed in common trench exceeds 16 inch overall.

2. Install underground-line warning tape for direct-buried cables and cables in raceways.

P. Laminated Acrylic or Melamine Plastic Signs: Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Business occupancy and vacancy sensors.

B. Related Requirements:

1. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding of lighting control devices referenced by this Section.
2. Section 260529 "Hangers and Supports for Electrical Systems" specifies hangers and supports referenced by this Section.
3. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs referenced by this Section.
4. Section 262726 "Wiring Devices" for wall-box dimmers and manual light switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Prepare and submit the following:

1. Show installation details for the following:
    a. Occupancy sensors.
    b. Vacancy sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Diagrams for power, signal, and control wiring.
4. Lighting Control Documentation: Floor plans indicating the following information:
    a. As-installed locations of switches and dimmers.
    b. Lighting zones and control strategy for each switch or dimmer, including unoccupied time-delay setting for shut-off and override time-delay setting for shut-off.
    c. Multilevel or dimming range capability for each switch or dimmer.
    d. Which switches or dimmers are operated by occupancy sensors, vacancy sensors, daylighting sensors, or time clocks.

C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements:

1. Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Must comply with CCR Title 24.

2.2 BUSINESS OCCUPANCY AND VACANCY SENSORS

A. Dual-Technology, Passive-Infrared (PIR) and Ultrasonic, Occupancy or Vacancy Sensor:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Cooper Lighting Solutions; Signify North America Corp.
    b. HLI Solutions; brand of GE Current, a Daintree Company.
2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for one of the following UL product categories:
    a. Energy Management Equipment: UL CCN PAZX, including UL 916 or UL 60730-1.
    b. Appliance Controls: UL CCN ATNZ, including UL 60730-1.
    c. Intrusion Detection Units: UL CCN ANSR, including UL 639.
4. Standard Features:
    a. Wall or ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
    b. Separate power pack.
    c. Hardwired connection to switch and BAS.
    d. Sensitivity Adjustment: Separate for each sensing technology.
    e. Detector Sensitivity: Detect occurrences of 6 inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch, and detect a person of average size and weight moving not less than 12 inch in either a horizontal or a vertical manner at an approximate speed of 12 inch/s.
        1) Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft when mounted on a 96 inch high ceiling.
        2) Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq. ft when mounted 48 inch above finished floor.
5. Operation:
    a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
    b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on

and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

B. Wall-Switch Occupancy Sensor:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Bryant; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
   b. Eaton.
   c. Hubbell Control Solutions; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
   d. Leviton Manufacturing Co., Inc.
   e. Sensor Switch, Inc.
   f. WattStopper; Legrand North America, LLC.

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory.
4. Standard Features:

   a. Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in single gang switchbox**,** with provisions for connection to BAS using a hardwired connection.

      1) Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
      2) Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
      3) Switch Rating: Not less than 800 VA driver or LED load at 120 V, 1200 VA driver or LED load at 277 V.

   b. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft.
   c. Sensing Technology: Dual technology - PIR and ultrasonic.
   d. Switch Type: Single pole, field-selectable automatic "on," or manual "on," automatic "off."
   e. Capable of controlling load in three-way application.
   f. Voltage: Match circuit voltage.
   g. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. Switch prevents lights from turning on when light level is higher than set point of sensor.
   h. Time Delay:

      1) Concealed, field-adjustable, "off" time-delay selector at up to 30

minutes.

i. Color: White.
j. Faceplate: Stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 INSTALLATION OF LIGHTING CONTROL DEVICES

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Maintenance: NFPA 70B.
3. Electrical Safety: NFPA 70E.
4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
5. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and

partition assemblies.

2. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's instructions.
3. Installation of Wiring:
    a. Conduit: Minimum conduit size is 1/2 inch.
    b. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's published instructions.
    c. Size conductors in accordance with lighting control device manufacturer's published instructions unless otherwise indicated.
    d. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

D. Interfaces with Other Work:

1. Identification: Provide labels for lighting control devices and associated electrical equipment.
    a. Identify field-installed conductors, interconnecting wiring, and components.
    b. Label each enclosure with engraved metal or laminated-plastic nameplate.
    c. Identify controlled circuits in lighting contactors.
    d. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
    e. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Perform manufacturer recommended tests and inspections.

1. Administer and perform tests and inspections with assistance of factory-authorized service representative.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to the Project site during other-than-normal occupancy hours for this purpose. Some of the Work may be required during hours of darkness.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

3.6 CLOSEOUT ACTIVITIES

A. Demonstration:

1. With assistance from factory-authorized service representatives, demonstrate to Owner's maintenance and clerical personnel and building occupants how to operate the following systems and equipment:
    a. Lighting control devices.

B. Training:
1. With assistance from factory-authorized service representatives, train Owner's maintenance personnel on the following topics:
    a. How to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262213 - LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution, dry-type transformers with nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
    a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and size of transformer.
    b. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Inspection: On receipt, inspect for and note shipping damage to packaging and transformer.

1. If manufacturer packaging is removed for inspection, and transformer will be stored after inspection, re-package transformer using original or new packaging materials that provide protection equivalent to manufacturer's packaging.

B. Storage: Store in warm, dry, and temperature-stable location in original shipping packaging.

C. Temporary Heating: Apply temporary heat in accordance with manufacturer's published instructions within enclosure of ventilated-type units, throughout periods during which equipment is not energized and when transformer is not in space that is continuously under normal control of temperature and humidity.

D. Handling: Follow manufacturer's instructions for lifting and transporting transformers.

PART 2 - PRODUCTS

2.1 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60 Hz service.

B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

C. Transformers Rated 15 kVA and Larger:

1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.
2. Marked as compliant with DOE 2016 efficiency levels by qualified electrical testing laboratory recognized by authorities having jurisdiction.

D. Shipping Restraints: Paint or otherwise color-code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside transformer enclosure.

2.2 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70, and list and label as complying with UL 1561.

B. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

1. One leg per phase.
2. Grounded to enclosure.

C. Coils: Continuous windings except for taps.

1. Coil Material: Aluminum.
2. Internal Coil Connections: Brazed or pressure type.
3. Terminal Connections: Bolted.

D. Enclosure: Ventilated.

1. Core and coil must be encapsulated within resin compound using vacuum-pressure impregnation process to seal out moisture and air.
2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.
3. Wiring Compartment: Sized for conduit entry and wiring installation.
4. Environmental Protection:
    a. Indoor: UL 50E, Type 2.
5. Finish Color: Gray weather-resistant enamel.

E. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

F. Insulation Class, Smaller Than 30 kVA: 180 deg C, UL-component-recognized insulation system with maximum of 115 deg C rise above 40 deg C ambient temperature.

G. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with maximum of 150 deg C rise above 40 deg C ambient temperature.

H. Grounding: Provide ground-bar kit or ground bar installed on inside of transformer enclosure.

I. Low-Sound-Level Requirements: Maximum sound levels when factory tested in accordance with IEEE C57.12.91, as follows:

1. 30.01 to 50.00 kVA: 45 dB(A-weighted).
2. 50.01 to 150.00 kVA: 50 dB(A-weighted).
3. 150.01 to 300.00 kVA: 55 dB(A-weighted).

2.3 IDENTIFICATION

A. Nameplates:

1. Engraved, laminated-acrylic or melamine plastic signs for distribution transformers, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for transformers.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's published instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance must be 5 Ω at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install transformers level and plumb on concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.

B. Construct concrete bases and anchor floor-mounted transformers in accordance with manufacturer's published instructions and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Secure transformer to concrete base in accordance with manufacturer's published instructions.

D. Secure covers to enclosure and tighten bolts to manufacturer-recommended torques to reduce noise generation.

E. Remove shipping bolts, blocking, and wedges.

3.3 CONNECTIONS

A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals in accordance with manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Provide flexible connections at conduit and conductor terminations and supports to eliminate sound and vibration transmission to building structure.

3.4 FIELD QUALITY CONTROL

A. Perform manufacturer recommended tests and inspections.

1. Engage factory-authorized service representative to support field tests and inspections.

3.5 ADJUSTING

A. Record transformer secondary voltage at unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262213

ECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panelboards.
2. Disconnecting and overcurrent protective devices.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. In addition to information identified in Section 013300 "Submittal Procedures," submit the following:

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
2. Include manufacturer's sample extended warranty language.

B. Shop Drawings: For each panelboard and related equipment:

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for SPD as installed in panelboard.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include wiring diagrams for power, signal, and control wiring.
9. Key interlock scheme drawing and sequence of operations.

C. Field quality-control reports.

1.3 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.4 QUALIFICATIONS

A. Low-Voltage Electrical Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

1. On-site electrical testing supervisors must have documented certification and experience with testing electrical equipment in accordance with NETA testing standards.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation in accordance with NECA 407.

1.6 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed panelboards perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Comply with NEMA PB 1.

D. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.
    a. Indoor Dry and Clean Locations: UL 50E, Type 1.
    b. Outdoor Locations: UL 50E, Type 3R.
    c. Other Wet or Damp Indoor Locations: UL 50E, Type 4.
    d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: UL 50E, Type 12.
2. Height: 7 ft maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims must cover live parts and may have no exposed hardware.
4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard

front with flanges for attachment to panelboard, wall, and ceiling or floor.

5. Finishes:
   a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   b. Back Boxes: Galvanized steel.

E. Phase, Neutral, and Ground Buses:
   1. Material: Hard-drawn copper, 98 percent conductivity.
      a. Plating must run entire length of bus.
      b. Bus must be fully rated for entire length.
   2. Interiors must be factory assembled into unit. Replacing switching and protective devices may not disturb adjacent units or require removing main bus connectors.
   3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

F. Conductor Connectors: Suitable for use with conductor material and sizes.
   1. Material: Hard-drawn copper, 98 percent conductivity.
   2. Terminations must allow use of 75 deg C rated conductors without derating.
   3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
   4. Main and Neutral Lugs: Compression type, with lug on neutral bar for each pole in panelboard.
   5. Ground Lugs and Bus-Configured Terminators: Compression type, with lug on bar for each pole in panelboard.

G. Future Devices: Panelboards or load centers must have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
   1. Percentage of Future Space Capacity: 10 percent.

H. Panelboard Short-Circuit Current Rating:
   1. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for 100 percent interrupting capacity.
      a. Panelboards and overcurrent protective devices rated 240 V or less must have short-circuit ratings as shown on Drawings, but not less than 10 000 A(rms) symmetrical.
      b. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V must have short-circuit ratings as shown on Drawings, but not less than 14 000 A(rms) symmetrical.

2.2 PANELBOARDS

A. UL QEUY - Distribution Panelboard:

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. ABB, Electrification Business
    b. Eaton
    c. Siemens Industry, Inc., Energy Management Division
    d. Square D; Schneider Electric USA
2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. Distribution Type Panelboards: UL CCN QEUY; including UL 67 and NEMA PB 1.
4. Standard Features:
    a. Mains: Circuit breaker.
        1) Location: Convertible between top and bottom.
        2) Main Breaker: Main lug interiors up to 400 A must be field convertible to main breaker.
    b. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers.
    c. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.
5. Other Available Features Required by Project:
    a. Surge Suppression: Factory installed as integral part of indicated panelboards, complying with UL 1449 SPD Type 2.
    b. Do not mount neutral bus in gutter.
    c. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
    d. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

B. UL QEUY - Lighting and Appliance Branch-Circuit Panelboard:

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. ABB, Electrification Business
    b. Eaton
    c. Siemens Industry, Inc., Energy Management Division
    d. Square D; Schneider Electric USA
2. Source Limitations: Obtain products from single manufacturer.

3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    a. Lighting and Appliance Branch-Circuit Type Panelboards: UL CCN QEUY; including UL 67 and NEMA PB 1.
4. Standard Features:
    a. Mains: Circuit breaker.
        1) Location: Convertible between top and bottom.
        2) Main Breaker: Main lug interiors up to 400 A must be field convertible to main breaker.
    b. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
5. Other Available Features Required by Project:
    a. Surge Suppression: Factory installed as integral part of indicated panelboards, complying with UL 1449 SPD Type 2.
    b. Do not mount neutral bus in gutter.
    c. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
    d. Doors: Door-in-door construction with concealed hinges; secured with flush latch with tumbler lock; keyed alike. Outer door must permit full access to panel interior. Inner door must permit access to breaker operating handles and labeling, but current carrying terminals and bus must remain concealed.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

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. ABB, Electrification Business
    2. Eaton
    3. Siemens Industry, Inc., Energy Management Division
    4. Square D; Schneider Electric USA

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
    1. Thermal-Magnetic Circuit Breakers:
        a. Inverse time-current element for low-level overloads.
        b. Instantaneous magnetic trip element for short circuits.
        c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
    2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
    3. Electronic Trip Circuit Breakers:

a. RMS sensing.
b. Field-replaceable rating plug or electronic trip.
c. Digital display of settings, trip targets, and indicated metering displays.
d. Multi-button keypad to access programmable functions and monitored data.
e. Ten-event, trip-history log. Each trip event must be recorded with type, phase, and magnitude of fault that caused trip.
f. Integral test jack for connection to portable test set or laptop computer.
g. Field-Adjustable Settings:

1) Instantaneous trip.
2) Long- and short-time pickup levels.
3) Long- and short-time adjustments.
4) Ground-fault pickup level, time delay, and I squared T response.

4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6 mA trip).
5. GFPE Circuit Breakers: Class B ground-fault protection (30 mA trip).
6. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240 V, single-pole configuration.
7. Subfeed Circuit Breakers: Vertically mounted.
8. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
e. Application Listing: Appropriate for application.
f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

2.4 MAINTENANCE MATERIAL ITEMS

A. Spare Parts: Furnish to Owner spare parts, for repairing panelboards and related equipment, that are packaged with protective covering for storage on-site and identified with labels describing contents. Include the following:

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and GFPE Types: Two spares for each panelboard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards in accordance with NECA 407.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NECA 407.
2. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Equipment Mounting:
    a. Attach panelboard to vertical finished or structural surface behind panelboard.
    b. Mount surface-mounted panelboards to steel slotted supports 1-1/4 inch in depth. Orient steel slotted supports vertically.
2. Provide mounting and anchoring devices.
3. Mount top of trim 7.5 ft above finished floor unless otherwise indicated.
4. Mount panelboard cabinet plumb and rigid without distortion of box.
5. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
6. Install overcurrent protective devices and controllers not already factory installed.
    a. Set field-adjustable, circuit-breaker trip ranges.
    b. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's published instructions.
7. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
8. Install filler plates in unused spaces.
9. Stub four 1 inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in future. Stub four 1 inch empty conduits into raised floor space or below slab not on grade.
10. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

D. Interfaces with Other Work:

1. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components.

B. Install warning signs.

C. Panelboard Nameplates: Label each panelboard with nameplate.

D. Device Nameplates: Label each branch circuit device in power panelboards with nameplate.

E. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles must be located on interior of panelboard door.

F. Breaker Labels: Faceplate must list current rating, UL and IEC certification standards, and AIC rating.

G. Circuit Directory:

1. Provide computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
    a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.

3.4 FIELD QUALITY CONTROL

A. Administrant for Low-Voltage Electrical Tests and Inspections:

1. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
2. Administer and perform tests and inspections with assistance of factory-authorized service representative.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Field tests and inspections must be witnessed by Architect.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage

air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers and Paragraph 7.19.1 Surge Arrestors, Low-Voltage. Do not perform optional tests. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:
    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
    c. Instruments and Equipment:
        1) Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

E. Nonconforming Work:

1. Panelboards will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

F. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

1. Include certified report that identifies panelboards included and that describes scanning results, with comparisons of two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.

1. Measure loads during period of normal facility operations.
2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within panelboard, may

not exceed 20 percent.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature in accordance with manufacturer's published instructions.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-use switches, dimmer switches, and fan-speed controller switches.
2. General-grade duplex straight-blade receptacles.
3. Receptacles with arc-fault and ground-fault protective devices.

1.2 DEFINITIONS

A. AFCI: Arc-Fault Circuit Interrupter.

B. Commercial/Industrial-Use Cord Reel: A cord reel subject to severe use in factories, commercial garages, construction sites, and similar locations requiring a harder service-type cord.

C. GFCI: Ground-Fault Circuit Interrupter.

D. UL 1472 Type I Dimmer: Dimmer in which air-gap switch is used to energize preset lighting levels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
    a. If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
    b. Listing criteria identified in approval letter must match specified listing criteria. UL label indicating approval of equipment's enclosure is not considered approval of equipment for intended application.
    c. Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for discontinued or superseded products are not acceptable for submitted product.
2. Include manufacturer's sample extended warranty language.

B. Shop Drawings:

1. Wiring diagrams for duplex straight-blade receptacles with integral switching means.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra stock material.

B. Special tools.

1.6 QUALIFICATIONS

A. Electrical Power Testing (EPT) Technician III: Possessing active NICET EPT Level III certification. Able to manage switching procedures, conduct tests of complex equipment, analyze test and equipment data, plan a job, and lead a team. Has experience performing NFPA 70B, IEEE, and NETA electrical tests.

B. Electrical Power Testing (EPT) Technician IV: Possessing active NICET EPT Level IV certification. Able to conduct tests of complex metering and relay systems; evaluate tests, test equipment, test results, and power system performance; recommend actions to maintain or improve system performance; and lead multi-team projects.

C. Electrical Power Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

1. On-site electrical testing supervisors must possess active NICET EPT Technician III certification.

1.7 WARRANTY FOR DEVICES

A. Special Installer Extended Warranty: Installer warrants that installed devices perform in accordance with specified requirements and agrees to repair or replace products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.

1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2.2 GENERAL-USE SWITCHES, DIMMER SWITCHES, AND FAN-SPEED CONTROLLER SWITCHES

A. Toggle Switch:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector
    b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated
    c. Leviton Manufacturing Co., Inc.
    d. Pass & Seymour; Legrand North America, LLC
2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: UL CCN WMUZ and UL 20.
4. Standard Features:
    a. Device Color: White.
    b. Configuration:
        1) Extra-heavy-duty, 120-277 V, 20 A, single pole.
5. Accessories:
    a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
    b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

B. Toggle Switch with Forked Key Lock:

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. Arrow Hart, Wiring Devices; Eaton, Electrical Sector
    b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated
    c. Leviton Manufacturing Co., Inc.
    d. Pass & Seymour; Legrand North America, LLC
2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: UL CCN WMUZ and UL 20.
4. Standard Features:
    a. Device Color: White.
    b. Configuration:
        1) 120-277 V, 20 A, single pole.

C. Type I Dimmer Switch:

1. Manufacturers: Subject to compliance with requirements, available

manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector
b. GE Lighting; a Savant Company
c. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated
d. Leviton Manufacturing Co., Inc.
e. Lutron Electronics Co., Inc
f. Pass & Seymour; Legrand North America, LLC

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: UL CCN EOYX and UL 1472.
4. Standard Features:
   a. UL 1472 Type I dimmer.
   b. Device Color: White.
   c. Switch Style: Toggle.
   d. Dimming Control Style: Slide.
5. Accessories:
   a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
   b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.3 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

A. Duplex Straight-Blade Receptacle:

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. Arrow Hart, Wiring Devices; Eaton, Electrical Sector
   b. Leviton Manufacturing Co., Inc.
   c. Pass & Seymour; Legrand North America, LLC
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
   a. Receptacles for Plugs and Attachment Plugs: UL CCN RTRT and UL 498.
   b. Surge Protective Devices: UL 1449, Type 3.
3. Standard Features:
   a. Device Color: White.
   b. Configuration:
      1) Heavy-duty, smooth face, NEMA 5-20R.
4. Other Available Features Required by the Project:

a. Has factory-terminated connectors on wiring device pigtails for quick installation.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

B. Tamper-Resistant Duplex Straight-Blade Receptacle:

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. Arrow Hart, Wiring Devices; Eaton, Electrical Sector
b. Leviton Manufacturing Co., Inc.
c. Pass & Seymour; Legrand North America, LLC

2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Receptacles for Plugs and Attachment Plugs: UL CCN RTRT and UL 498.
b. Surge Protective Devices: UL 1449, Type 3.

3. Standard Features:

a. Device Color: White.
b. Configuration:

1) Heavy-duty, smooth face, NEMA 5-20R.

4. Other Available Features Required by the Project:

a. Has factory-terminated connectors on wiring device pigtails for quick installation.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.4 RECEPTACLES WITH ARC-FAULT AND GROUND-FAULT PROTECTIVE DEVICES

A. General-Grade, Tamper-Resistant Duplex Straight-Blade Receptacle with AFCI Device:

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. Arrow Hart, Wiring Devices; Eaton, Electrical Sector

b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour; Legrand North America, LLC

2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Outlet Branch-Circuit Type AFCIs: UL CCN AWBZ, UL 498, UL 1699, and UL Subject 1699A.

3. Standard Features:

a. Device Color: White.
b. Configuration: Heavy-duty, NEMA 5-20R.

4. Other Available Features Required by the Project:

a. Has factory-terminated connectors on wiring device pigtails for quick installation.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

B. General-Grade, Tamper-Resistant Duplex Straight-Blade Receptacle with AFCI and GFCI Device:

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. Arrow Hart, Wiring Devices; Eaton, Electrical Sector
b. Leviton Manufacturing Co., Inc.
c. Pass & Seymour; Legrand North America, LLC

2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Outlet Branch-Circuit Type GFCIs and AFCIs: UL CCN KCXX, UL 498, UL 943, UL 1699, and UL Subject 1699A.

3. Standard Features:

a. Device Color: White.
b. Configuration: Heavy-duty, NEMA 5-20R.

4. Other Available Features Required by the Project:

a. Has factory-terminated connectors on wiring device pigtails for quick installation.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

C. General-Grade, Weather-Resistant, Tamper-Resistant Duplex Straight-Blade Receptacle with GFCI Device:

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. Arrow Hart, Wiring Devices; Eaton, Electrical Sector
b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour; Legrand North America, LLC

2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Receptacle GFCIs: UL CCN KCXS, UL 498, and UL 943.

3. Standard Features:

a. Device Color: White.
b. Configuration: Heavy-duty, NEMA 5-20R.

4. Other Available Features Required by the Project:

a. Has factory-terminated connectors on wiring device pigtails for quick installation.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.5 MAINTENANCE MATERIAL ITEMS FOR STRAIGHT-BLADE RECEPTACLES

A. Extra Stock Material: Furnish to Owner extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Special Tools: Furnish to Owner proprietary equipment, keys, and software required to operate, maintain, repair, adjust, or implement future changes to controlled receptacles, that are packaged with protective covering for storage on-site and identified with labels describing contents.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receptacles:

1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 SELECTION OF CONTROLLED AND UNCONTROLLED RECEPTACLES

A. Private and Open Office Spaces:

1. Uncontrolled Receptacles at Workstations: Coordinate final locations of receptacles with furniture plan such that at least one uncontrolled receptacle is selected for installation not greater than 6 ft. (1.8 m) from each workstation.
2. Contact Architect for resolution of discrepancies between these requirements and Drawings.

3.3 INSTALLATION OF SWITCHES

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Life Safety and Means of Egress Work: NFPA 101.
4. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
5. Wiring Devices: NECA NEIS 130.
6. Mounting Heights: NECA NEIS 1.
7. Consult Architect for resolution of conflicting requirements.

C. Interfaces with Other Work:

1. Identification:
    a. Identify cover or cover plate for device with panelboard identification and circuit number.
    b. Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.
    c. Provide warning signs and arc-flash hazard warning labels for electrical equipment.

3.4 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
4. Work in ITE Rooms: NFPA 75.
5. Work in Confined Spaces: NFPA 350.
6. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
7. Installing and Maintaining Wiring Devices: NECA NEIS 130.
8. Mounting Heights: Unless otherwise indicated in the Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
9. Receptacle Orientation: Unless otherwise indicated in the Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
10. Consult Architect for resolution of conflicting requirements.

C. Interfaces with Other Work:

1. Identification: Provide labels for receptacles and associated electrical equipment.
    a. Identify field-installed conductors, interconnecting wiring, and components.
    b. Label each enclosure with engraved metal or laminated-plastic nameplate.
        1) Identify cover or cover plate for device with panelboard identification and circuit number.
        2) Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.
    c. Provide warning signs and arc-flash hazard warning labels for electrical equipment.

3.5 FIELD QUALITY CONTROL OF SWITCHES

A. Administrant for Electrical Power Tests and Inspections:

1. Administer and perform tests and inspections with assistance of factory-authorized service representative.

B. Field tests and inspections must be witnessed by Architect.

C. Tests and Inspections:

1. Perform tests and inspections in accordance with manufacturers' published instructions.

D. Nonconforming Work:

1. Unit will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

F. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.

1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.6 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

A. Administrant for Electrical Power Tests and Inspections:

1. Administer and perform tests and inspections with assistance of factory-authorized service representative.

B. Field tests and inspections must be witnessed by Architect.

C. Tests and Inspections:

1. Insert and remove test plug to verify that device is securely mounted.
2. Verify polarity of hot and neutral pins.
3. Measure line voltage.
4. Measure percent voltage drop.
5. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.
6. Perform additional installation and maintenance inspections and diagnostic tests in accordance with NECA NEIS 130 and manufacturers' published instructions.

D. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

F. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.

1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.7 SYSTEM STARTUP FOR SWITCHES

A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's published instructions.

B. Manufacturer Services: Engage factory-authorized service representative to support system startup.

1. Manufacturer's Field Reports for System Startup Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.8 ADJUSTING

A. Occupancy Adjustments for Controlled Receptacles: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to the Project during other-than-normal occupancy hours for this purpose.

3.9 PROTECTION

A. Devices:

1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

1. Molded-case circuit breakers (MCCBs).
2. Enclosures.

1.2 DEFINITIONS

A. GFEP: Ground-fault circuit-interrupter for equipment protection.

B. GFLS: Ground-fault circuit-interrupter for life safety.

C. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
2. Enclosure types and details for types other than UL 50E, Type 1.
3. Current and voltage ratings.
4. Short-circuit current ratings (interrupting and withstand, as appropriate).
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.5 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed

enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

B. Special Manufacturer Extended Warranty: Manufacturer warrants that enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Three years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain products from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 MOLDED-CASE CIRCUIT BREAKERS

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. ABB, Electrification Business
2. Eaton
3. Siemens Industry, Inc., Energy Management Division
4. Square D; Schneider Electric USA

B. Circuit breakers must be constructed using glass-reinforced insulating material. Current carrying components must be completely isolated from handle and accessory mounting area.

C. Circuit breakers must have toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. Circuit-breaker handle must be over center, be trip free, and reside in tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon must be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with push-to-trip button, located on face of circuit breaker to mechanically operate circuit-breaker tripping mechanism for maintenance and testing purposes.

D. Maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings must be clearly marked on face of circuit breaker. Circuit breakers must be 100 percent rated.

E. MCCBs must be equipped with device for locking in isolated position.

F. Lugs must be suitable for75 deg C rated wire.

G. Standard: Comply with UL 489 with required interrupting capacity for available fault currents.

H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, RMS sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I-squared t response.

K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

L. GFLS Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6 mA trip).

M. GFEP Circuit Breakers: With Class B ground-fault protection (30 mA trip).

N. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Application Listing: Appropriate for application.
3. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
4. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
6. Electrical Operator: Provide remote control for on, off, and reset operations.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: Enclosure must be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (UL 50E Type 1).

C. Conduit Entry: UL 50E Types 4, 4X, and 12 enclosures may not contain knockouts. UL 50E Types 7 and 9 enclosures must be provided with threaded conduit openings in both endwalls.

D. Operating Mechanism: Circuit-breaker operating handle must be externally operable with operating mechanism being integral part of box, not cover directly operable through front cover of enclosure (UL 50E Type 1) directly operable through dead front trim of enclosure (UL 50E Type 3R). Cover interlock mechanism must have externally operated override. Override may not permanently disable interlock mechanism, which must return to locked position once override is released. Tool used to override cover interlock mechanism must not be required to enter enclosure in order to override interlock.

E. Enclosures designated as UL 50E Type 4, 4X stainless steel, 12, or 12K must have dual cover interlock mechanism to prevent unintentional opening of enclosure cover when circuit breaker is ON and to prevent turning circuit breaker ON when enclosure cover is open.

F. UL 50E Type 7/9 enclosures must be furnished with breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

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

1. Commencement of work will indicate Installer's acceptance of areas and conditions as satisfactory.

3.2 SELECTION OF ENCLOSURES

A. Indoor, Dry and Clean Locations: UL 50E, Type 1.

B. Outdoor Locations: UL 50E, Type 3R.

C. Other Wet or Damp, Indoor Locations: UL 50E, Type 4.

D. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: UL 50E, Type 12.

3.3 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Special Techniques:

1. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
2. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

3.4 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.5 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by Architect.

B. Tests and Inspections for Molded-Case Circuit Breakers:

1. Visual and Mechanical Inspection:
    a. Verify that equipment nameplate data are as described in the Specifications and shown on Drawings.
    b. Inspect physical and mechanical condition.
    c. Inspect anchorage, alignment, grounding, and clearances.
    d. Verify that unit is clean.
    e. Operate circuit breaker to ensure smooth operation.
    f. Inspect bolted electrical connections for high resistance using one of the following methods:
        1) Use low-resistance ohmmeter.
            a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
        2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
            a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data,

use NETA ATS Table 100.12.

g. Inspect operating mechanism, contacts, and chutes in unsealed units.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.

c. Perform contact/pole resistance test. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

d. Perform insulation resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values may be no less than 2 MΩ.

e. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and close coils must be as indicated by manufacturer.

f. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset trip logs and indicators. Investigate units that do not function as designed.

g. Verify operation of charging mechanism. Investigate units that do not function as designed.

3. Test and adjust controls, remote monitoring, and safeties.

C. Nonconforming Work:

1. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Collect, assemble, and submit test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

E. Manufacturer Services:

1. Engage factory-authorized service representative to support field tests and inspections.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

3.7 PROTECTION

A. After installation, protect enclosed switches and circuit breakers from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

3.8 MAINTENANCE

A. Infrared Scanning of Enclosed Switches and Breakers: Two months after Substantial Completion, perform infrared scan of joints and connections. Remove covers so joints and connections are accessible to portable scanner. Take visible light photographs at same locations and orientations as infrared scans for documentation to ensure follow-on scans match same conditions for valid comparison.

1. Instruments and Equipment: Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
2. Follow-up Infrared Scanning: Perform two follow-up infrared scans of enclosed switches and breakers, one at four months and another at 11 months after Substantial Completion.
3. Instrument: Use infrared-scanning device designed to measure temperature or to detect significant deviations from normal values. Provide documentation of device calibration.
4. Report: Prepare certified report that identifies units checked and that describes scanning results. Include notation of deficiencies detected, remedial actions taken, and scanning observations after remedial action.

END OF SECTION 262816

SECTION 263323 - CENTRAL BATTERY EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Emergency lighting and power equipment.
2. Auxiliary lighting and power equipment.

1.2 DEFINITIONS

A. DDC: Direct digital control.

B. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).

C. Interruptible: As used in the Section Text, an off-line, passive-standby or line-interactive, inverter-only unit, with an intentional interruption of power to the load until an internal transfer switch picks up and transfers the load to the unit's inverter and internal battery source on loss of the "normal" source, and then retransfers to the "normal" source when it is restored. Transfer time can be "slow" (up to approximately 1 second) or "fast" (2-4 ms or 40-50 ms, depending on manufacturer).

D. Li-ion: Lithium-ion.

E. Ni-Cd: Nickel-cadmium.

F. OCPD: Overcurrent protective device.

G. PWM: Pulse-width modulated.

H. TDD: Total demand (harmonic current) distortion (also listed as "THD" in catalog data by manufacturers).

I. THD(V): Total harmonic voltage distortion.

J. Uninterruptible: As used in the Section Text, an on-line, double-conversion (rectifier/inverter) unit, with no interruption of power to the load on interruption and restoration of the "normal" source.

K. UPS: Uninterruptible power supply.

L. VRLA: Valve-regulated lead acid.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and rating of central battery equipment unit.

1. Include features, performance, electrical ratings, operating characteristics, shipping and operating weights, shipping splits, and furnished options, specialties, and accessories.
2. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
    a. If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
    b. Listing criteria identified in approval letter must match specified listing criteria. UL label indicating approval of equipment's enclosure is not considered approval of equipment for intended application.
    c. Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for discontinued or superseded products are unacceptable for submitted product.
3. Include manufacturer's sample extended warranty language.

B. Shop Drawings: Prepare and submit the following for each central battery equipment unit:

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, ventilation requirements, method of field assembly, components, and location and size of each field connection.
3. Include system one-line diagram, internal and interconnecting wiring, and diagrams for power, signal, and control wiring.
4. Include elevation, details, and legends of control and indication displays.
5. Include -circuit current (withstand) rating of unit.
6. Layout Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around central battery equipment. Show central battery equipment layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

C. Factory test reports.

D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data, include the following:

1. Manufacturer's published instructions for testing central battery equipment.

B. Warranty documentation.

C. Maintenance service agreement.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Spare parts.

B. Consumable items.

1.6 QUALIFICATIONS

A. Electrical Power Testing and Inspecting Agency: Entities possessing active credentials from qualified electrical testing laboratory recognized by authorities having jurisdiction.

1. On-site electrical testing supervisors must possess active NICET Electrical Power Testing (EPT) Technician III certification.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store central battery equipment in accordance with NECA NEIS 411.

B. Deliver equipment in fully enclosed vehicles.

C. Store equipment in spaces having environments controlled in accordance with manufacturer's published instructions for ambient temperature and humidity conditions for non-operating equipment.

1.8 FIELD CONDITIONS

A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for central battery equipment, including clearances between central battery equipment and adjacent surfaces and other items.

1.9 WARRANTY FOR CENTRAL BATTERY EQUIPMENT

A. Special Installer Extended Warranty: Installer warrants that installed central battery equipment performs in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.

1. Extended Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

1.10 WARRANTY FOR BATTERIES

A. Special Manufacturer Extended Warranty for Batteries: Manufacturer warrants that batteries perform in accordance with specified requirements and agrees to repair or replace batteries that fail to perform as specified within extended-warranty period.

Warranty must convey to Owner upon acceptance of the Work.

1. Initial Extended Warranty Period for Batteries: Five years from date of Substantial Completion; full coverage for materials only, free on board origin, freight prepaid.
2. Follow-On Extended-Warranty Period for Batteries: 15 years from date of Substantial Completion; prorated coverage for materials only, free on board origin, freight prepaid.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Criteria:

1. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 EMERGENCY LIGHTING AND POWER EQUIPMENT

A. Description: This product group includes electrical emergency lighting and power equipment for use in accordance with UL 924, NFPA 101, Article 700 of NFPA 70, and ICC IBC.

B. Source Quality Control:

1. Factory Tests:
    a. Owner will witness required factory tests. Notify Architect at least 14 days before date of tests and indicate their approximate duration.
    b. Testing Administrant: Engage qualified electrical testing agency to evaluate central battery equipment fabricator's quality-control and testing methods.
    c. Factory Tests and Inspections: Perform tests and inspections on central battery equipment, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, in accordance with UL 924 before delivering to site. Affix label with name and date of manufacturer's qualified electrical testing laboratory's certification of system compliance.
        1) Functional test and demonstration of all functions, controls, indicators, sensors, and protective devices.
        2) Full-load test.
        3) Transient-load response test.
        4) Overload test.
        5) Power failure test.
    d. Nonconforming Work:
        1) Equipment that does not pass tests and inspections will be considered defective.

e. Factory Test Reports: Compile and submit factory test and inspection reports.

C. Interruptible (Slow-Transfer) Emergency Lighting Inverter:

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. ABB, Electrification Business
b. Dual-Lite; brand of GE Current, a Daintree company; American Industrial Partners (AIP)
c. Eaton
d. Lithonia Lighting; Acuity Brands Lighting, Inc.
e. Myers Emergency Power Systems

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Emergency Lighting and Power Equipment: UL CCN FTBR, including UL 924, NFPA 101, Article 700 of NFPA 70, and ICC IBC.

4. Standard Features:

a. Slow-Transfer Central Battery Equipment: Passive-standby (off-line) system. Automatically sense loss of normal alternating-current (AC) supply and use an electromechanical transfer switch to transfer loads. Transfer in one second or less from normal supply to battery-inverter supply.
b. Automatic Operation:

1) Normal Conditions: Supply the load with AC power flowing from normal AC power input terminals, bypassing inverter, with battery connected in parallel via rectifier/charger output.
2) Abnormal Supply Conditions: If normal AC supply deviates from specified voltage, transfer switch operates and battery supplies constant, regulated AC power through the inverter to the load, with a momentary loss of power to the load.
3) If normal power fails, transfer switch operates and battery supplies constant, regulated AC power through the inverter to the load, with a momentary loss of power to the load.
4) If a fault occurs in system when being supplied by inverter and current flows in excess of the overload rating of inverter, inverter automatically protects itself against damage from overloads and short circuits by shutting down.
5) When normal AC power is restored at input supply terminals of unit, controls automatically retransfer the load back to the normal AC supply, with a momentary loss of power to the load. Rectifier/charger then recharges battery.
6) If normal power failure is prolonged (more than 90 minutes), integral low-voltage battery protective circuit disconnects battery and prevents battery from damage due to deep discharge.

7) If battery becomes discharged, and when normal AC supply is again available, rectifier/charger recharges battery. When battery is fully charged, rectifier/charger automatically shifts to float-charge mode.
8) If battery is disconnected, and normal AC power is available, central battery equipment continues to supply power to the load with no degradation of its regulation of voltage and frequency of output bus.

c. Unit Operating Requirements:

1) Input AC Voltage Tolerance: Plus 10 and minus 15 percent of central battery equipment input voltage rating.
2) Input Frequency Tolerance: Plus or minus 3 percent of central battery equipment frequency rating.
3) Synchronizing Slew Rate: 1 Hz per second, maximum.
4) Minimum Off-Line Efficiency: 95 percent at 60 Hz, full load.
5) Minimum Displacement Primary-Side Power Factor: 96 percent under any load or operating condition.
6) Ambient Temperature Rating (Other than Batteries): Not less than 68 deg F and not exceeding 86 deg F.
7) Ambient Storage Temperature Rating (Other than Batteries): Not less than minus 4 deg F and not exceeding 158 deg F.
8) Ambient Temperature Rating (Batteries): Not less than 32 deg F and not exceeding 104 deg F.
9) Ambient Storage Temperature Rating (Batteries): Not less than 0 deg F and not exceeding 104 deg F.
10) Humidity Rating: Less than 95 percent (noncondensing).
11) Altitude Rating: Not exceeding 3300 ft.
12) Off-Line Overload Capability: 1.1 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.

d. Inverter and Controls Logic: Microprocessor based, isolated from all power circuits; provides complete self-diagnostics, periodic automatic testing and reporting; with alarms.

e. Status Indication: Door-mounted, labeled LED indicators or digital screen displaying the following conditions:

1) Normal power available.
2) Status of system.
3) Battery charging status.
4) On battery power.
5) System fault.
6) External fault.

f. Remote Signal Interfaces:

1) Remote Indication Interface: A minimum of one programmable (Form C) dry-circuit relay output(s), 120 V(ac), 2 A, for remote indication of the following:

a) Fault or status indication.

b) On bypass.
c) Low battery.

g. Communications Interface: Factory-installed hardware and software to enable a remote PC to program central battery equipment and monitor and display status and alarms.

1) Communications Ports: TIA-232.

2) Compliance with ASHRAE 135: Controllers must support serial MS/TP and Ethernet IP communications and must be able to communicate directly via DDC system for HVAC TIA-485 serial networks and Ethernet 10Base-T networks as a native device.

h. Self-Protection and Reliability Features:

1) Input transient protection by means of SPDs to provide protection against damage from supply voltage surges as defined in IEEE C62.45, Category B and C.
2) Integral, programmable, self-diagnostic and self-test circuitry; with alarms and logging.
3) Battery deep-discharge and self-discharge protection; with alarms.
4) Battery self-test circuitry; with alarms and logging.

i. Integral Input Disconnecting Means and OCPD: Thermal-magnetic circuit breaker, complying with UL 489.

1) Integrated Equipment Minimum Short-Circuit Current (Withstand) Rating: 22 kA.

j. Inverter: Solid-state, high-frequency, PWM type, with the following operational features:

1) Automatically regulate output voltage to within plus or minus 3 percent, for all load ranges and for maximum 25 percent step-load changes; regulation may increase to 8 percent for 100 percent step-load changes.
2) Automatically regulate output frequency to within plus or minus 1 Hz, from no load to full load, at unity power factor, over the operating range of battery voltage.
3) Output Voltage Waveform: Sine wave with maximum 3 percent TDD throughout battery operating-voltage range, for 100 percent linear load.
4) Load Power Factor: 0.5 lead to 0.5 lag.
5) Inverter Overload Capability: 115 percent for 10 minutes; 150 percent surge for 10 seconds.

k. Rectifier/Battery Charger:

1) Solid state, variable rate, temperature compensated; automatically maintains batteries in fully charged condition when normal power is available.

2) Maximum Battery Recharge Time from Fully Discharged State: 24 hours.

l. Batteries: Standard VRLA batteries.

1) Capable of sustaining full-capacity output of inverter unit for minimum of 90 minutes.
2) Battery Disconnect and OCPD: Manufacturer's standard.

m. Integral Output Disconnecting Means and OCPD:

1) Single-Output OCPD: As scheduled on Drawings; manufacturer's standard ratings based on unit output ratings.

n. Enclosures: UL 50E, listed for environmental conditions at installed location.

1) Dry and Clean Indoor Locations: Type 1 steel cabinets with access to components through hinged doors with flush tumbler lock and latch.
2) Finish: Manufacturer's standard baked-enamel finish over corrosion-resistant prime treatment.

5. Other Available Features Required by the Project:

a. Audible alarm with silencer switch.

b. Remote Summary Alarm Panel: Labeled LEDs on panel faceplate must indicate five basic status conditions. Audible signal indicates alarm conditions; silencing switch in face of panel silences signal without altering visual indication.

1) Cabinet and Faceplate: Surface or flush mounted to suit mounting conditions indicated.
2) Maximum Distance from Main Unit: 1000 ft.

2.3 MAINTENANCE MATERIAL ITEMS

A. Spare Parts: Furnish to Owner spare parts, for repairing central battery equipment, that are packaged with protective covering for storage on-site and identified with labels describing contents. Include the following:

1. Output Circuit Breakers: One for every 10 of each type and rating, but no fewer than one of each type.
2. Output Circuit Breaker Open/Tripped Alarm Contacts: One for every 10 supplied, but no fewer than one of each type.

B. Consumable Items:

1. After completion of field quality control, startup, commissioning, adjusting, and closeout activities, replace air filters.
2. Furnish to Owner extra consumable items for storage on-site, identified with labels describing contents. Include the following:

a. Cabinet Ventilation Filters: One complete set.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, surfaces, and substrates to receive central battery equipment, with Installer present, for compliance with requirements for installation tolerances, structural support, ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's published instructions for environmental conditions have been permanently established in spaces where equipment will be installed, before installation begins.

B. Examine equipment before installation. Reject equipment that is wet, moisture damaged, or mold damaged.

C. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

3.3 INSTALLATION OF CENTRAL BATTERY EQUIPMENT

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Maintenance: NFPA 70B.
3. Electrical Safety: NFPA 70E.
4. Commissioning of Electrical Systems: NECA NEIS 90.
5. Commissioning of Active and Passive Fire Protection Features: NFPA 3 and NFPA 4.
6. Fire-Alarm and Premises Security Work: NFPA 72 and NECA NEIS 305.
7. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
8. Work in ITE Rooms: NFPA 75.
9. Life-Safety and Means-of-Egress Work: NFPA 101.
10. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
11. Work in Confined Spaces: NFPA 350.
12. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
13. Evaluation of Unlabeled Electrical Equipment: NFPA 791.
14. Installing and Maintaining Uninterruptible Power Supplies: NECA NEIS 411.
15. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
2. Coordinate layout and installation of central battery equipment with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
3. Wall-Mounted Central Battery Equipment: Install central battery equipment on walls with tops at uniform height and with disconnect operating handles not higher than 79 inch above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall.
4. Connections: Interconnect system components. Make connections to supply and load circuits in accordance with manufacturer's wiring diagrams unless otherwise indicated.
5. Wiring Methods:
    a. Install conductors and cables concealed in accessible ceilings, walls, and floors where possible.
    b. Conceal raceway and cables except in unfinished spaces.
    c. Provide plenum-rated cable, where installed exposed or in open cable tray, within environmental airspaces, including plenum ceilings.
    d. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

D. Interfaces with Other Work:

1. Hangers and Supports:
    a. Floor-Mounted Central Battery Equipment: Install central battery equipment on concrete base.
        1) Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18 inch centers around the full perimeter of concrete base.
        2) For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
        3) Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
        4) Install anchor bolts to elevations required for proper attachment to supported equipment.
2. Grounding and Bonding: Ground and bond equipment.
    a. Separately Derived Systems: Make grounding connections to grounding electrodes and bonding connections to metallic piping systems as indicated; comply with Article 250 of NFPA 70.
3. Identification: Provide labels for central battery equipment and associated

electrical equipment.

a. Identify field-installed conductors, interconnecting wiring, and components.
b. Label each enclosure with engraved metal or laminated-plastic nameplate.
c. Provide warning signs and arc-flash hazard warning labels for electrical equipment.
d. Operating Instructions: Frame printed operating instructions for central battery equipment, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of central battery equipment units.

4. Installation of Control Wiring:
   a. Install wiring between central battery equipment and remote devices and facility's central-control system.

3.4 FIELD QUALITY CONTROL

A. Administrant for Electrical Power Tests and Inspections:
   1. Administer and perform tests and inspections with assistance of factory-authorized service representative.

B. Acceptance Testing Preparation:
   1. Inspect and Test Each Component:
      a. Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.
      b. Test insulation resistance for all external branch circuit, feeder, control, and alarm wiring connected to central battery equipment element and component.
      c. Test continuity of each circuit.

C. Field tests and inspections must be witnessed by Architect.

D. Tests and Inspections:
   1. Inspect central battery equipment, wiring, components, connections, and equipment installation.
   2. Test insulation resistance for all external branch circuit, feeder, control, and alarm wiring connected to central battery equipment element and component.
   3. Test continuity of each circuit.
   4. Verify that input voltages and frequencies at central battery equipment locations are within voltage and frequency limits specified in Part 2. If outside this range, notify Architect before closing input OCPDs.
   5. Perform each visual and mechanical inspection and electrical test stated in manufacturer's published instructions and in NETA ATS, including specifically those for batteries, battery chargers, and UPS, regardless of the type of central battery equipment provided. Certify compliance with test parameters.
   6. Perform a load-duration test at rated voltage and rated output current to verify the correct functional operation of the unit under full-load stable operating conditions

for the minimum time limits required by UL 924. Monitor and record ambient temperature and temperatures within the unit.

7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

E. Nonconforming Work:

1. Equipment will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

F. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

G. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.

1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.5 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's published instructions.

B. Manufacturer Services: Engage factory-authorized service representative to support system startup.

1. Manufacturer's Field Reports for System Startup Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.6 ADJUSTING

A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

B. Set field-adjustable switches, auxiliary relays, and other adjustable parts.

C. Adjust the trip settings of thermal-magnetic circuit breakers with adjustable, instantaneous-trip elements; install fuses if not factory installed.

D. Set the automatic system test parameters.

E. Set field-adjustable, circuit-breaker trip ranges in accordance with Coordination Study

Report.

3.7 CLOSEOUT ACTIVITIES

A. Training:

1. With assistance from factory-authorized service representative, train Owner's maintenance personnel on the following topics:
    a. How to adjust, operate, and maintain central battery equipment.
    b. How to use and reprogram microprocessor-based control, monitoring, and display functions.

3.8 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature in accordance with manufacturer's published instructions until controllers are ready to be energized and placed into service.

B. Replace central battery equipment whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.9 MAINTENANCE

A. Infrared Scanning of Central Battery Equipment: After final acceptance, but not more than two months after Substantial Completion, perform infrared scan of joints and connections. Remove covers so joints and connections are accessible to portable scanner. Take visible light photographs at same locations and orientations as infrared scans for documentation to ensure follow-on scans match same conditions for valid comparison.

1. Follow-On Infrared Scanning: Perform two follow-up infrared scans of central battery equipment, one at four months and another at 11 months after Substantial Completion.
2. Instrument: Use infrared-scanning device designed to measure temperature or to detect significant deviations from normal values. Provide documentation of device calibration.
3. Field Reports for Infrared Scanning: Prepare certified report that identifies equipment that was checked and that describes scanning results. Include notation of deficiencies detected, remedial actions taken, and scanning observations after remedial action.

B. Maintenance Service Agreement: Beginning at Substantial Completion, verify that maintenance service agreement includesone year period for full maintenance by skilled employees of central battery equipment Installer. Include manufacturer's recommended frequency for preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper central battery equipment operation. Verify that parts and supplies are manufacturer's authorized replacement parts and supplies.

END OF SECTION 263323

SECTION 265000 - LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Luminaires.
2. Luminaire fittings.

1.2 DEFINITIONS

A. BUG Rating: Backlight, uplight, and glare rating for light pollution from exterior luminaires.

B. Correlated Color Temperature (CCT): The absolute temperature (in kelvins) of a blackbody whose chromaticity (color quality) most nearly resembles that of the light source.

C. Color Rendering Index (CRI): The measure of the degree of color shift objects undergo when illuminated by the light source as compared with the color of those same objects when illuminated by a reference light source. The lower the CRI of a light source, the more difficult it is to identify colors and stripes on electronic components and wiring.

D. IDA: International Dark-Sky Association.

E. IES: Illuminating Engineering Society.

F. LPD: Lighting power density.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Luminaires: Include the following additional information:

a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

1) If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.

b. Product Certificates: Include product certificates stating compliance with standards listed below, signed by manufacturer or fabricator.

1) Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with current accreditation under National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.
2) Testing Agency Certified Data: For luminaires indicated on Lighting Fixture Schedule on the Drawings, photometric data certified by qualified independent testing laboratory. Photometric data for remaining luminaires must be certified by manufacturer.

c. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
d. Include operating characteristics, electrical characteristics, and furnished accessories.
e. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on the Drawings.
f. Include battery and charger data for emergency lighting units.
g. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
h. Include photometric data and adjustment factors obtained from qualified laboratory tests.
i. Include manufacturer's sample warranty language.

2. Luminaire Fittings: Include the following additional information:

a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

1) If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.

b. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
c. Include operating characteristics, electrical characteristics, and furnished accessories.
d. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on the Drawings.
e. Include manufacturer's sample warranty language.

B. Shop Drawings: Prepare and submit the following:

1. Drawings, Diagrams, and Supporting Documents for Custom Luminaires:
    a. Include plans, elevations, sections, and mounting and attachment details.
    b. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    c. Include diagrams for power, signal, and control wiring.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Spare parts.

B. Extra stock material.

1.6 QUALIFICATIONS

A. Electrical Power Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.
    1. On-site electrical testing supervisors must possess active NICET EPT Technician III certification.

B. Luminaire Photometric Testing Laboratory: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" accredited under NIST HB 150-1, and complying with applicable IES testing standards.

C. Lighting Testing and Inspecting Agency: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" with documented training and experience with testing and inspecting lighting installations in accordance with applicable IES standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect exposed surface finishes on lighting equipment by applying strippable, temporary protective covering before shipping.

1.8 WARRANTY FOR LUMINAIRES

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed luminaires perform in accordance with specified requirements and agrees to repair or replace products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.
    1. Extended-Warranty Period: Two years from date of Substantial Completion; full

coverage for labor, materials, and equipment.

B. Special Manufacturer Extended Warranty: Manufacturer warrants that luminaires perform in accordance with specified requirements and agrees to provide repair or replacement of products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Five years from date of Substantial Completion; full coverage for labor, materials, and equipment.

1.9 WARRANTY FOR BATTERIES

A. Special Manufacturer Extended Warranty for Batteries: Manufacturer warrants that batteries perform in accordance with specified requirements and agrees to provide repair or replacement of batteries that fail to perform as specified within extended-warranty period.

1. Initial Extended-Warranty Period for Batteries: Three years from date of Substantial Completion; full coverage for materials only, free on board origin, freight prepaid.
2. Follow-On Extended-Warranty Period for Batteries: 10 years from date of Substantial Completion; prorated coverage for materials only, free on board origin, freight prepaid.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2.2 LUMINAIRES

A. Surface-Mounted, Recessed, Emergency, and Exit Luminaires:

1. Manufacturers: Subject to compliance with requirements. Provide luminaires as indicated in Light Fixture Schedule on drawings.
2. Source Limitations: Obtain products for this luminaire type from single manufacturer.
3. Listing Criteria:
    a. LED Luminaires: UL CCN IFAM; including UL 1598.
    b. Outdoor Canopy Luminaires: UL CCN IFAW; including UL 1598.
    c. Marked in accordance with UL CCN HYXT, including UL 1598, for compatible power supply, installation location, and environmental conditions.
4. Standard Features:
    a. Openings: Doors, frames, and access panels must operate smoothly, not leak light under operating conditions, and permit relamping without use of

tools or parts falling from enclosure.

b. Nominal Operating Voltage: As indicated on drawings.

c. Nominal Luminaire Operating Power Rating: As indicated on drawings.
d. CRI: As indicated on drawings.
e. Ballast or Driver Location: As indicated on drawings.
f. Materials: As indicated on drawings.

g. LED Luminaires (UL CCN IFAM):

1) Output Intensity: As indicated on drawings
2) Efficacy: As indicated on drawings.
3) Rated Life: As indicated on drawings.

4) CCT: As indicated on drawings.

5. Other Available Features Required by the Project: As indicated on drawings

a. Mounting Height: As indicated on drawings.

b. Finishes: As indicated on drawings.

c. Dimmable from 100 percent to zero percent of maximum light output.

2.3 LUMINAIRE FITTINGS

A. Luminaire Support Accessories:

1. Standard Features:

a. Sized and rated for luminaire weight.
b. Capable of maintaining luminaire position after cleaning and relamping.
c. Capable of supporting luminaire without causing deflection of ceiling or wall.
d. Capable of supporting horizontal force equal to 100 percent of luminaire weight and vertical force equal to 400 percent of luminaire weight.

2. Other Available Features Required by the Project:

a. Hook Hangers: Integrated assembly matched to luminaire, supply voltage, and equipment with threaded attachment, cord, and locking-type plug.
b. Aircraft Cables: 5/32 inch diameter aircraft cable supports adjustable to 10 ft in length.
c. Rod Hangers: 3/16 inch nominal diameter, cadmium-plated, threaded steel rod.

2.4 MAINTENANCE MATERIAL ITEMS

A. Spare Parts: Furnish to Owner spare parts, for repairing lighting equipment, that are packaged with protective covering for storage on-site and identified with labels describing contents. Include the following:

1. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
2. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

B. Extra Stock Material: Furnish to Owner extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Include the following:

1. Luminaire-Mounted Emergency Battery Packs: One for every 20 of each type and rating installed. Furnish at least one of each type.

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 luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Lighting: If approved by Architect, specified luminaires for the Project may be installed for temporary lighting. Install and energize minimum quantity of luminaires necessary to meet needs of construction activities. When construction is sufficiently complete, remove, disassemble, clean, and relamp luminaires used for temporary lighting before reinstalling for the Project's delivery.

3.3 SELECTION OF LUMINAIRES

A. Finished Spaces:

1. Location: As indicated on drawings .

B. Unfinished Spaces:

1. Location: As indicated on drawings .

3.4 INSTALLATION OF LIGHTING

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
3. Work in Confined Spaces: NFPA 350.
4. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
5. Installation of Indoor Lighting Systems: NECA NEIS 500.
6. Installation of Exterior Lighting Systems: NECA NEIS 501.

7. Installation of Luminaires, Lampholders, and Lamps: Article 410 of NFPA 70.
8. Installation of Extra-Low-Voltage Lighting: Article 411 of NFPA 70.
9. Installation of Emergency Lighting and Exit Signs: ICC IBC, NFPA 101, and Parts IV and V in Article 700 of NFPA 70.
10. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Install luminaires level, plumb, and square with finished floor or grade unless otherwise indicated.
2. Install luminaires at height and aiming angle as indicated on the Drawings.
3. Coordinate layout and installation of luminaires with other construction.
4. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.
5. Exterior Corrosion Prevention:
    a. Do not use aluminum in contact with earth or concrete. When in direct contact with dissimilar metals, protect aluminum with insulating fittings or treatment.
    b. When embedding steel conduits in concrete, wrap conduit with 10 mil thick, pipe-wrapping plastic tape applied with a 50 percent overlap.
6. Flush-Mounted Luminaire Support:
    a. Secured to outlet box.
    b. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
    c. Trim ring flush with finished surface.
7. Wall-Mounted Luminaire Support: Attached to structural members in walls.
    a. Do not attach luminaires directly to gypsum board.
8. Suspended Luminaire Support:
    a. Ceiling Mount:
        1) Two aircraft cables.
    b. Pendants and Rods: Where longer than 48-inch, brace to limit swinging.
    c. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
    d. Continuous Rows of Luminaires: Provide tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
    e. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
9. Ceiling-Grid-Mounted Luminaire Support:
    a. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each luminaire. Locate not more than 6 inch from

luminaire corners.

b. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner with clips that are UL listed for application.

c. Luminaires of Sizes Smaller than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with no fewer than two 3/4 inch metal channels spanning and secured to ceiling tees.

10. Remote Mounting of Ballasts or Drivers: Do not exceed distance between ballast or driver and luminaire recommended by ballast or driver manufacturer.
11. Emergency Power Units: Secure with approved fasteners in four or more locations, spaced near corners of unit.
12. Install wiring connections for luminaires.
13. Identification: Provide labels for luminaires and associated electrical equipment.

    a. Identify field-installed conductors, interconnecting wiring, and components.
    b. Provide warning signs.
    c. Label each enclosure with engraved metal or laminated-plastic nameplate.

D. Systems Integration: Integrate lighting control devices and equipment with electrical power connections for operation of luminaires as specified.

3.5 FIELD QUALITY CONTROL OF LIGHTING

A. Administrant for Electrical Power Tests and Inspections:

1. Administer and perform tests and inspections with assistance of factory-authorized service representative.

B. Administrant for Field Tests and Inspections of Lighting Installations:

1. Administer and perform tests and inspections with assistance of factory-authorized service representative.

C. Field tests and inspections must be witnessed by Architect.

D. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections.
2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
3. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
4. Verify operation of photoelectric controls.
5. Exterior Illumination Tests:

    a. Measure light intensities at night. Use photometers with calibration referenced to NIST standards.

E. Nonconforming Work:

1. Luminaire will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

F. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

G. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.

1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project's site.

3.6 SYSTEM STARTUP

A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's published instructions.
2. Burn-in lamps that require specific aging period to operate properly, prior to occupancy by Owner.
3. Charge emergency power units and batteries minimum of 24 hours and conduct one-hour discharge test.

B. Manufacturer Services: Engage factory-authorized service representative to support system startup.

1. Manufacturer's Field Reports for System Startup Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project's site.

3.7 ADJUSTING

A. Luminaire Aiming Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aiming direction of luminaires to suit occupied conditions. Make up to two visits to the Project's site during other-than-normal hours for this purpose. Some of the Work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies must be manufacturer's authorized replacement parts and supplies.
3. Adjust aim of luminaires in presence of Architect.

3.8 CLOSEOUT ACTIVITIES

A. Training:

1. With assistance from factory-authorized service representatives, train Owner's maintenance personnel on the following topics:

a. How to adjust, operate, and maintain luminaires and photoelectric controls.

3.9 PROTECTION

A. After installation, protect lighting equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 265000

SECTION 265668 – EXTERIOR ATHLETIC LIGHTING, Retrofit Lighting System with LED Upgrade

PART 1 – GENERAL

1.1 SUMMARY

A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.

B. The purpose of these specifications is to define the lighting system performance and design standards for Houseman Field Retrofit using an LED Lighting source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.

C. The sports lighting will be for the following venues:

1. Football (360’ x 160’)
2. Track
3. Field Events

D. The primary goals of this sports lighting project are:

1. Energy Efficient Lighting Design – Upgrade by replacing existing HID luminaires with the same number of LED luminaires (or fewer), meeting minimum required light levels and achieving the greatest possible amount of energy savings.
    a. Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore, light levels are guaranteed to not drop below specified target values for a period of 25 years.
    b. Environmental Light Control: It is the primary goal of this project to minimize spill light to adjoining properties and glare to the players, spectators and neighbors.
    c. Cost of Ownership: In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be eliminated for the duration of the warranty.
2. Control and Monitoring – To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system. Fields should be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.
    a. Control and monitoring system shall provide contactor control of all existing circuits, replacing existing contactor cabinets. Key switches shall be provided to provide field-level control of existing circuit groups.
    b. Entertainment Features: Incorporation of theatrical light shows enhance the presentation and enjoyment of players and spectators. Control system

shall incorporate pre-programmed light shows such as "chase", “wave”, and “score.” Control system shall incorporate the ability to initiate these shows locally. System shall be able to time light shows to customer-supplied music.

1.2 ONFIELD LIGHTING PERFORMANCE

A. Illumination Levels and Design Factors: Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting manufacturers will provide a guarantee that light levels will be sustained over the life of the warranty period. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below.

B. Manufacturers will provide lumen maintenance data of the LED luminaires used per TM-21-11 and will Incorporate the lumen maintenance projections into the lighting designs to ensure target light levels are achieved throughout the guaranteed period of the system. Per IES guidelines, lumen maintenance hours should be reported based on the 6x multiplier of testing hours.

Area of Lighting	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Football	50FC	2:1	72	30’ x 30’
Track	30FC	6:1	44	30’ x 30’
Field Events	15FC	4:1	38	20’ x 20’

C. Color Temperature: The lighting system shall have a minimum color temperature of 5700K and a CRI of 75.

D. Playability: Lighting design and luminaire selection should be optimized for playability by reducing on-field glare and providing sufficient uplight.

1. Aiming Angles: To reduce glare, luminaire aiming should ensure the top of the luminaire field angle (based on sample photometric reports) is a minimum of 10 degrees below horizontal.
2. Glare control technology – Luminaires selected should have glare control technology including, but not limited to: external visors, internal shields and louvres. No symmetrical beam patterns are acceptable.
3. Aerial lighting – Adequate illumination must be provided above the field in order to see the ball in flight. It is recommended that a lighting analysis be performed above the field of play to evaluate the visibility of the ball over its typical trajectory to ensure the participants will adequately see the ball. Calculation planes should be evaluated up to the maximum anticipated height for the level of play.

1.3 ENVIRONMENTAL LIGHT CONTROL

A. Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers and external shields. No symmetrical beam patterns are accepted.

B. Spill Light and Glare Control: The lighting equipment manufacturer shall assess both spill and glare at all areas of concern on adjacent properties. Spill and glare shall be assessed by measuring horizontal footcandles, vertical footcandles, and candela, per IESNA RP-6-22 section 2.3.4. To minimize impact, values must not exceed the following levels taken at 3 feet above grade (5 feet for candela). Field measurements of spill light and glare shall be taken at the areas of concern.

Spill & Glare Along Surrounding Streets	**Maximum**
Horizontal Footcandles	0.45 FC
Vertical Footcandles	1.2 FC
Candela (taken at 5 ft above grade)	35,000 CD

C. Spill Scans: Spill scans must be submitted indicating the amount of horizontal and vertical footcandles along the specified lines. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights. Illumination level shall be measured in accordance with the IESNA RP-6-22 after 1 hour warm up.

D. Sample Photometry: The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified testing laboratory with a minimum of five years of experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

E. Field Verification – Lighting manufacturer shall supply field verification of environmental light control using a meter calibrated within the last 12 months:

1. Spill verification: The light sensing surface of the light meter should be held 36 inches above the playing surface with the sensing surface horizontal (for horizontal readings) or vertically pointed at the brightest light bank (for max vertical readings).

1.4 COST OF OWNERSHIP

A. Manufacturer shall submit a 25-year Cost of Ownership summary that includes energy consumption, anticipated maintenance costs, and control costs. All costs associated with faulty luminaire replacement - equipment rentals, removal and installation labor, and shipping - are to be included in the maintenance costs.

PART 2 – PRODUCT

2.1 SPORTS LIGHTING SYSTEM CONSTRUCTION

A. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.

B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.

C. System Description: Lighting system is intended to mount to existing structures and shall reuse existing foundations, poles, and underground supply wiring. The system shall consist of the following:

1. Existing equipment: Strength and condition of existing poles and foundations must be verified as strong enough to handle the weight and windloading of new equipment by calculation and visual inspection.
2. Poletop luminaire assembly: Galvanized steel poletop luminaire assemblies to replace existing poletop by slip fit over the pole sections, bolting to top flange, or clamping to pole. Lighting manufacturer must supply new crossarms, or supply certified structural calculations that show crossarms are strong enough to support new loads without deflection.
3. All luminaires, visors, and poletop luminaire assemblies shall withstand 150 mi/h winds and maintain luminaire aiming alignment.
4. Manufacturer will supply all drivers and supporting electrical equipment
    a. Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures, to ensure accessible maintenance should the need arise. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure. Integral drivers are not allowed.
    b. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2_2002.
5. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
6. Control cabinet to provide remote on-off control, monitoring, and entertainment

features of the lighting system. See Section 2.3 for further details.

7. Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.

    a. If grounding is not integrated into the structure, the manufacturer or installer shall supply grounding electrodes, down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780.

D. Safety: All system components shall be UL listed for the appropriate application.

2.2 ELECTRICAL

A. Electric Power Requirements for the Sports Lighting Equipment:

1. Electric power: 480 Volt, 3 Phase
2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

B. Energy Consumption: The kW consumption for the field lighting system shall be less than 75kW.

2.3 CONTROL

A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.

B. Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.

C. Contactor control of lights: To minimize wear on drivers and other electrical components and prevent lights from turning on due to communication loss, circuits must be controlled via contactor switching, not dimming driver output to zero.

D. Dimming: System shall provide for 4-stage dimming (high-medium-low-blackout). Dimming will be set via scheduling options (Website, app, phone, fax, email) or via an onsite user interface tablet or device.

E. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute “early off” commands by phone. Scheduling tool shall be capable of setting curfew limits.

Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

F. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).

G. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS, Android and Blackberry devices.

Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.

1. Cumulative hours: shall be tracked to show the total hours used by the facility
2. Report hours saved by using early off and push buttons by users.

H. Communication Costs: Manufacturer shall include communication costs for operating the control and monitoring system for the duration of the 25 year warranty.

I. Communication with luminaire drivers: Control system shall interface with drivers in electrical components enclosures by means of powerline communication.

J. Entertainment Features: Control System shall store (6) pre-programmed light shows and (4) minutes of light show programming set to licensed music supplied by the customer. Shows shall be initiated by a manufacturer-provided touchscreen user interface on the control system network.

2.4 STRUCTURAL PARAMETERS

A. Wind Loads: Wind loads shall be based on the 2015 International Building Code. Wind loads to be calculated using ASCE 7-10, an ultimate design wind speed of 2015 and exposure category C.

B. Pole Structural Analysis: The stress analysis and safety factor of the poles shall conform to 2013 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-6).

PART 3 – EXECUTION

3.1 DELIVERY TIMING

A. Delivery Timing Equipment On-Site: The equipment must be on-site 8-12 weeks from receipt of approved submittals and receipt of complete order information.

3.2 FIELD QUALITY CONTROL

A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA RP-6-22.

B. Field Light Level and offsite Glare Accountability

1. Light levels are guaranteed not to fall below the target maintained light levels for the entire warranty period of 25 years. These levels will be specifically stated as “guaranteed” on the illumination summary provided by the manufacturer.
2. The contractor/manufacturer shall be responsible for conducting initial light level testing and an additional inspection of the system, in the presence of the owner, one year from the date of commissioning of the lighting.
3. The contractor/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. Contractor/Manufacturer will be held responsible for any damage to the fields during these repairs.

C. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels, including footcandles, uniformity ratios, and uplight for aerial visibility, are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to make adjustments to meet specifications and satisfy Owner.

4.4 WARRANTY AND GUARANTEE

A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.

B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Manufacturer is responsible for removal and replacement of failed luminaires, including all parts, labor, shipping, and equipment rental associated with maintenance. Owner agrees to check fuses in the event of a luminaire outage.

PART 4 – DESIGN APPROVAL

4.1 PRE-BID SUBMITTAL REQUIREMENTS (Non-Musco)

A. Design Approval: The owner / engineer will review pre-bid submittals per section 4.0.B from all the manufacturers to ensure compliance to the specification 10 days prior to bid. If the design meets the design requirements of the specifications, a letter and/or addendum will be issued to the manufacturer indicating approval for the specific design submitted.

B. Approved Product: Musco's Light-Structure System™ Retrofit with TLC for LED™ is the approved product. All substitutions must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.

C. All listed manufacturers not pre-approved shall submit the information at the end of this section at least 10 days prior to bid. An addendum will be issued prior to bid; listing approved lighting manufacturers and the design method to be used.

D. Bidders are required to bid only products that have been approved by this specification or addendum by the owner or owner's representative. Bids received that do not utilize an approved system/design, will be rejected.

REQUIRED SUBMITTAL INFORMATION FOR ALL MANUFACTURERS (NOT PRE-APPROVED) 10 DAYS PRIOR TO BID

All items listed below are mandatory, shall comply with the specification and be submitted according to pre-bid submittal requirements. Complete the Yes/No column to indicate compliance (Y) or noncompliance (N) for each item. ***Submit checklist below with submittal.***

Yes/ No	Tab	Item	Description
	A	Letter/ Checklist	Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. Signed submittal checklist to be included.
	B	Equipment Layout	Drawing(s) showing field layouts with pole locations
	C	On Field Lighting Design	Lighting design drawing(s) showing: a. Field Name, date, file number, prepared by b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x & y), Illuminance levels at grid spacing specified c. Pole height, number of fixtures per pole, horizontal and vertical aiming angles, as well as luminaire information including wattage, lumens and optics d. Height of light test meter above field surface. e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance (CV), coefficient of utilization (CU) uniformity gradient; number of luminaries, total kilowatts, average tilt factor; light loss factor.
	D	Off Field Lighting Design	Lighting design drawing showing initial spill light levels along the boundary line (defined on bid drawings) in footcandles. Lighting design showing glare along the boundary line in candela. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights.
	E	Photometric Report	Provide first page of photometric report for all luminaire types being proposed showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years of experience.
	F	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels must be guaranteed to not fall below target levels for warranty period. Glare values in candela must be guaranteed to not be exceeded.
	G	Control & Monitoring System	Manufacturer of the control and monitoring system shall provide written definition and schematics for automated control system and entertainment packages. They will also provide 10 references of customers currently using proposed system in the state of Michigan.
	H	Warranty	Provide written warranty information including all terms and conditions. Provide 10 references of customers currently under specified warranty in the state of Michigan.
	I	Project References	Manufacturer to provide a list of 10 projects where the technology and specific fixture proposed for this project has been installed in the state of Michigan. Reference list will include project name, project city, installation date, and if requested, contact name and contact phone number.
	J	Product Information	Complete bill of material and current brochures/cut sheets for all product being provided.
	K	Delivery	Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.
	L	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.
	M	Cost of Ownership	Document cost of ownership as defined in the specification. Identify energy costs for operating the luminaires. Maintenance cost for the system must be included. All costs should be based on 25 Years

The information supplied herein shall be used for the purpose of complying with the specifications for ***Houseman Field Retrofit***. By signing below I agree that all requirements of the specifications have been met and that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in the Non-Compliance section.

Manufacturer: _____ **Signature:** _____

Contact Name: _____ **Date:** _____/_____/_____

Contractor: _____ **Signature:** _____

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Stripping and stockpiling topsoil.
4. Removing above- and below-grade site improvements.
5. Disconnecting, capping or sealing, and removing site utilities.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.4 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premisesas indicated by owner.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

E. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.

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

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

C. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and

security, and utilities sections; and in Section 024119 "Selective Demolition."

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, synthetic turf.
3. Excavation and backfilling for structures.
4. Subbase course for concrete walks and pavements.
5. Subbase course and base course for asphalt paving.
6. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, will be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other fabricated stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for

hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct preexcavation conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports.

1.5 FIELD CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100

percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washedcrushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap

before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.

3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: Minimum width each side of pipe/conduit/duct bank as required to allow a vibratory hand compactor to achieve density in the trench.

C. Trench Bottoms:

1. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

a. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 SUBGRADE INSPECTION

A. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Surveying locations of underground utilities for Record Documents.
2. Testing and inspecting underground utilities.
3. Removing concrete formwork.
4. Removing trash and debris.
5. Removing temporary shoring, bracing, and sheeting.
6. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Roadways: refer to trench detail on plans.

D. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

a. Carefully compact initial backfill under pipe haunches and compact evenly

up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

F. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.11 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass, synthetic grass, and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at

95 percent.

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1/2 inch.
2. Walks: Plus or minus 1/2 inch.
3. Pavements: Plus or minus 1/2 inch.

3.15 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Shape subbase course and base course to required crown elevations and cross-slope grades.
2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D1557.

3.16 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

3.17 FIELD QUALITY CONTROL

A. Special Inspections: Contractor will engage a qualified special inspector to perform the following special inspections:

B. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is

obtained.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Construction dewatering.

1.2 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer in the State of Michigan.

B. Delegated Design Submittals: For dewatering system, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installer: An experienced installer that has specialized in design of dewatering systems and dewatering work.
2. Delegated Design Engineer: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.
3. Land Surveyor: A professional land surveyor who is legally qualified to practice in state where Project is located.

1.5 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, registered in the State of Michigan to design dewatering system.

B. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of groundwater and permit excavation and construction to proceed on dry, stable subgrades.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide temporary grading to facilitate dewatering and control of surface water.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below groundwater level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control groundwater to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks monthly during dewatering and maintain an accurate log of surveyed elevations for comparison with original

elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

END OF SECTION 312319

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes temporary excavation support and protection systems.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer in the State of Michigan.

B. Delegated-Design Submittal: For excavation support and protection systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Professional Engineer: Experience with providing delegated-design engineering services of the type indicated, including documentation that engineer is licensed in the state in which Project is located.

B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Existing Conditions: Using photographs, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.

1.5 CLOSEOUT SUBMITTALS

A. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.6 FIELD CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility-serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Owner's written permission.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey

adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks, and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in other areas of the project manual to design excavation support and protection systems to resist all lateral loading and surcharge, including but not limited to, retained soil, groundwater pressure, adjacent building loads, adjacent traffic loads, construction traffic loads, material stockpile loads, and seismic loads, based on the following:

1. Compliance with OSHA Standards and interpretations, 29 CFR 1926, Subpart P.
2. Compliance with AASHTO Standard Specification for Highway Bridges or AASHTO LRFD Bridge Design Specification, Customary U.S. Units.
3. Compliance with requirements of authorities having jurisdiction.
4. Compliance with utility company requirements.
5. Compliance with railroad requirements.

2.2 MATERIALS

A. Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A36/A36M, ASTM A690/A690M, or ASTM A992/A992M.

C. Steel Sheet Piling: ASTM A328/A328M, ASTM A572/A572M, or ASTM A690/A690M; with continuous interlocks.

1. Corners: Site-fabricated mechanical interlock.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application.

E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

F. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

G. Tiebacks: Steel bars, ASTM A722/A722M.

H. Tiebacks: Steel strand, ASTM A416/A416M.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Locate excavation support and protection systems clear of permanent construction, so that construction and finishing of other work is not impeded.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.

3.2 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation.

1. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement.
2. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging.
3. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds.

1. Trim excavation as required to install lagging.
2. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.3 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.

B. Accurately place the piling using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer.

1. Limit vertical offset of adjacent sheet piling to 60 inches.
2. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

C. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

A. Drill, install, grout, and tension tiebacks.

B. Test load-carrying capacity of each tieback, and replace and retest deficient tiebacks.

1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.

C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 BRACING

A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
2. Install internal bracing if required to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic

pressures.

3.6 MAINTENANCE

A. Monitor and maintain excavation support and protection system.

B. Prevent surface water from entering excavations by grading, dikes, or other means.

C. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

3.7 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open.

1. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions.
2. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.8 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures.

1. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
2. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction, and abandon remainder.
3. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earth Moving."
4. Repair or replace, as approved by Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 315000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hot-mix asphalt paving.
2. Cold milling of existing asphalt pavement.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for demolition and removal of existing asphalt pavement.
2. Section 312000 "Earth Moving" for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
3. Section 321313 "Concrete Paving" for concrete pavement and for separate concrete curbs, gutters, and driveway aprons.
4. Section 321373 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Hot-Mix Asphalt Designs:

1. For each hot-mix asphalt design proposed for the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. Aggregates.
2. Asphalt binder.
3. Tack coat.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of MDOT for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Coarse Aggregate: ASTM D692/D692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

B. Fine Aggregate: ASTM D1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

C. Mineral Filler: ASTM D242/D242M or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320 binder designation PG 58-28.

B. Asphalt Cement: ASTM D3381/D3381M for viscosity-graded material ASTM D946/D946M for penetration-graded material.

C. Tack Coat: ASTM D977 or AASHTO M 140 emulsified asphalt, or ASTM D2397/D2397M or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

2.3 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and any other recycled materials are not allowed.

2.4 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes; designed in accordance with procedures in AI MS-2, "Asphalt Mix Design Methods"; and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: As noted on construction drawings.
3. Surface Course: As noted on construction drawings.

PART 3 - EXECUTION

3.1 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth as noted on construction drawings.
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Patch surface depressions deeper than 1 inch after milling, before wearing course is laid.
7. Keep milled pavement surface free of loose material and dust.
8. Do not allow milled materials to accumulate on-site.

3.2 SURFACE PREPARATION

A. Ensure that prepared subgrade has been proof-rolled and is ready to receive paving. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.

3.3 HOT-MIX ASPHALT PLACEMENT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at a minimum temperature of 250 deg F.
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.4 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method in accordance with AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.5 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041/D2041M, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.

B. Replace and compact hot-mix asphalt where core tests were taken.

C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 321216

SECTION 321216.20 - TRACK SURFACE AND MARKING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Preparation and finishing of new synthetic track surface and markings.
2. Preparation and finishing of new synthetic long jump and pole vault track surface and markings.
3. Preparation and finishing of new synthetic D-zone track surface.

B. Markings:

1. The Houseman Field track shall be marked for 8-42 inch lanes and shall include all event markings as recommended by the National Federation of State High School Association (NFHS) and the Michigan High School Athletic Association (MHSAA).
2. The Briggs Field track shall be marked for 6-42 inch lanes, except along the south straight-away, where it shall be marked for 8-42 inch lanes; and shall include all event markings as recommended by the National Federation of State High School Association (NFHS) and the Michigan High School Athletic Association (MHSAA).
3. The long jumps and pole vault shall be marked for 1-48 inch lane.

C. Installation Scope:

1. Houseman Field: Install an IAAF approved, impermeable polyurethane synthetic track system consisting of SBR Rubber and BEYPUR, a single-component polyurethane binder and BEYPUR, a poured-in-place, two-component U.V. stabilized elastomeric polyurethane wearing layer with an embedded textured finish.
2. Briggs Field: Install an IAAF approved, porous polyurethane synthetic track system comprised of a base layer of polyurethane-bound SBR granules and topped with BEYPUR, a single-component polyurethane structural spray, and EPDM granules.

D. Layout and paint all track lines and event markings as required and specified by current NFHS and MHSAA.

E. Codes and Standards: Codes and standards follow the current guidelines set forth by the International Amateur Athletic Federation (IAAF), the National Federation of State High School Association (NFHS), and the Michigan High School Athletic Association (MHSAA), along with the current material testing guidelines as published by the American Society of Testing and Materials (ASTM).

F. Related Sections include the following:

1. Section 321216 – Asphalt Paving: For Hot-Mixed-Asphalt Pavement.

1.2 COORDINATION

A. The synthetic surfacing contractor shall coordinate the work specified with an

authorized and appointed representative of the owner so as to perform the work during a period and in a manner acceptable to the owner.

1.3 SUBMITTALS

A. Track surface and markings - one sample for each track 12” X 12” in size minimum, of the same synthetic track surfacing system to be installed on this project.

B. Surface Color:

1. Houseman Field:

a. Track: Light Blue with lane marking and symbol colors approved by owner.
b. Track Exchange Zones: Mid Gray with lane marking and symbol colors approved by owner.
c. D-zones: Light Blue
d. Long Jump: Light Blue with lane marking and symbol colors approved by owner.
e. Pole Vault: Light Blue with lane marking and symbol colors approved by owner.

2. Briggs Field:

a. Track: Beynon Red with lane marking and symbol colors approved by owner.
b. Long Jump: Beynon Red with lane marking and symbol colors approved by owner.

C. Each Bidder shall submit a complete installation specification with the bid and any items that are regarded as technical guidelines for the installation of the surface that varies from the specification include maintenance instructions and recommendations.

D. Standard printed specifications of the synthetic track surfacing system to be installed on this project.

E. An affidavit attesting that the synthetic track surfacing material to be installed meets the requirements defined by the manufacturers currently published specifications and any modifications outlined in those technical specifications.

F. A synthetic track surfacing system sample, 12” x 12” in size, of the same synthetic track surfacing system to be installed on this project at each site.

G. A list of completed facilities, including the installing supervisor, of the exact synthetic track surfacing system.

H. Each Bidder shall submit a list of facilities that have been installed under this product name. List to include four (4) to five (5) year old surface installations with contact person, and telephone number.

I. Contractor must submit copies, in triplicate, of the Material Data Safety Sheets (MSDM) for all products to be used, before materials are delivered to the site.

J. Markings:

1. Submit to the Engineer a drawing showing locations of all proposed track markings and a chart with the appropriate colors to be used.

a. Computations.

b. Verify the locations of proposed events with the Owner.
c. Calculations shall be made to the nearest 1/100,000th of a foot.
d. Calculations of the angle shall be made to the nearest one second.
e. Calculations shall be submitted prior to the painting.
f. Calculations shall be made by or certified by the surveyor completing the work.
g. All measurements and tolerances shall conform to those recommended by the NFHS for track and field event layout.
h. Submit product literature for paint for prior approval from Engineer. The paint must be recommended by the manufacturer of track surface.
i. Upon completion, supply the Owner with all necessary as-built drawings showing markings color coding of each event.
j. Upon completion, a letter of certification attesting to the accuracy of the markings shall be submitted by the Licensed Surveyor in charge of the layout. The letter shall be signed and sealed by the person or persons in charge of the layout indicating the state of registration, number and name.

1.4 TESTING

A. The Owner shall reserve the right to submit the surface to determine the surface performance. Any section of the track that is found to be unacceptable by these standards shall be removed and replaced in a proper workmanship-like manner.

B. The sample size shall be approximately one (1) square foot. The samples shall be taken for testing and not replaced. A sample shall be taken for every four thousand (4,000) square feet. If the surface is acceptable, the Owner will accept the responsibility of the testing cost and the replacement cost for surface areas.

1.5 QUALITY ASSURANCE

A. The manufacturer must have ten (10) uninterrupted years of experience in the installation of full depth poured-in-place two component elastomeric polyurethane synthetic track surfacing while operating business under the same name.

B. The polyurethane manufacturer must have a minimum of ten years of experience with the compounding of two-part polyurethane for athletic surfaces.

C. The synthetic track surface shall be installed by authorized applicators of the approved manufacturer, acceptable to the Owner. The Owner reserves the right to final acceptance with regards to any installers. The manufacturer must attest to the work previously completed by each person installing the work.

D. The supervisor for the installation must have installed a minimum of TEN full depth two component polyurethane tracks with embedded texture in the last 2 years. A reference list must be submitted. No substitutions allowed.

E. The CONTRACTOR/MFG must have a minimum of one Class 1 IAAF Certified facilities installed in the United States.

F. The CONTRACTOR/MFG must have a certified track builder on staff.

G. The MANUFACTURER/INSTALLER must be one and the same Installer must be a member of the United States Tennis Courts and Track Builders Association (USTC & TBA).

PART 2 - PRODUCTS

2.1 TRACK SURFACES

A. Houseman Field: Install an IAAF approved, BSS-300 System by Beynon Sports Surfaces synthetic surfacing system with embedded textured finish.

B. Briggs Field: Install an IAAF approved, BSS-100 System by Beynon Sports Surfaces synthetic surfacing system with embedded textured finish.

2.2 MATERIALS

A. BSS-300:

1. Elastomeric Polyurethane:
    a. BEYPUR, the two-component U.V. stabilized elastomeric polyurethane compounded from polyol and isocyanate components, based on one hundred percent Methylene Diphenyl Isocyanate (MDI). No Toluene Diisocyanate Isocyanate (TDI) will be allowed.
    b. The elastomeric polyurethane shall be the color specified on plans.
2. EPDM Granulate:
    a. The EPDM granulates shall be 1 to 3mm in size and only be BRG H56 and Peroxide cured.
    b. The EPDM granulates and the U.V. stabilized elastomeric polyurethane shall be color matched.
3. Rubber Granulate of the base course:
    a. Styrene Butadiene Rubber (SBR) processed ground to a graded size of 1-3mm.
    b. A maximum of 82%, by weight of the paved-in-place base layer, of SBR will be allowed.
4. Single Component Polyurethane Binder: Shall be BEYPUR 300, a single-component polyurethane binder with a long cure time for use in paved mat specifications. A minimum of 18%, by weight of the paved-in-place base layer.
5. Seal Coat: Shall be BEYPUR 200, a two-component polyurethane pore sealer use with paved rubber granule mats. The granular SBR and binder layer shall be sealed with the BEYPUR 200. The application of EPDM dust is not allowed.
6. Line Marking Paint: Single-component, moisture cured, aliphatic polyurethane paint.

B. BSS-100:

1. Primers: Primers shall be BEYPRIM, a polyurethane-based primer specifically formulated to be compatible with the paved-in-place SBR granules and BEYPUR track surfacing material.
2. Black SBR Granules: The rubber granules for the base mat shall be recycled SBR rubber, processed and chopped to 1-3mm size, containing less than 1% dust.

3. EPDM Granules: The rubber granules for the BEYPUR structural spray wearing coats shall be EPDM, synthetic rubber containing a minimum 20% EPDM resin, with a specific gravity of 1.5 ± 0.1 g/cm3. The EPDM rubber shall be the same color as chosen by the owner for the track surface.

4. Polyurethane Binder: Binder for the black mat shall be BEYPUR, an MDI-based single-component, polyurethane binding agent. The binder shall not have a free TDI monomer level above 0.2% and must be solvent free. The binder must be specially formulated for compatibility with SBR rubber crumb.

5. Structural Spray Coating: The spray coating shall be BEYPUR, an MDI-based single-component, moisture cured, 100% solids, pigmented polyurethane, specifically formulated for compatibility with EPDM granules. The coating shall be the color specified by the owner. Pigment intergraded in the field shall not be allowed.

6. Line Marking Paint: All line and event markings shall be applied by experienced personnel utilizing a single component, moisture cured, aliphatic polyurethane paint compatible with the BSS 100 Track Surfacing material.

2.3 PHYSICAL PROPERTY'S OF TRACK SURFACE

A. BSS-300:

1. Thickness: Average - 12-13mm
2. Force Reduction: 35-50%
3. Modified Vertical Deformation: 0.6mm to 2.5mm
4. Friction: 0.5 (47 TRRL Scale)
5. Tensile Strength: 0.5 Mpa
6. Elongation at Break 40%

B. BSS-100:

1. Thickness: Average - 12-13mm
2. Force Reduction: 35-50%
3. Modified Vertical Deformation: 0.6mm to 2.5mm
4. Friction: 0.5 (47 TRRL Scale)
5. Tensile Strength: 0.4 Mpa
6. Elongation at Break 40%

PART 3 - EXECUTION

3.1 SURFACE INSPECTION

A. Prior to the application of the synthetic track surface, the asphaltic or concrete base shall be inspected for conformity to planarity requirements. The surface shall not deviate from the specific grade more than 1/8 inch in 10 feet measured in any direction. All areas not in conformance with the above requirements will be repaired by others, with compatible materials as approved by the manufacturer and allowed to cure prior to application of synthetic surface.

1. Curing: Before application of the synthetic surface can begin, the asphalt should be cured for at least 14 days; and a concrete base a minimum of 28 days.
2. Cleaning: The area to be surfaced shall be cleaned and free of any loose or foreign particles (dirt, oil, etc.) prior to commencement of the work. The surface shall be cleaned by use of a power blower and/or high pressure washer.

3.2 INSTALLATION

A. Layout and painting of track markings shall be in accordance with the drawings, manufacturers' specifications, and recommendations of the United States Track Builders Association. Layout shall be performed by a licensed surveyor.

1. Locate and confirm both new radius points.
2. Establish and set all necessary control points.
3. Measurements shall be made on the track to the nearest 1/100th of a foot.
4. Angles shall be set by using a transit or theodilite capable of reading direct to 20 seconds.
5. The markings on the curve may also be set by using the chord length method.
6. Measurements shall be made with an engineering steel tape or EDM in engineering scale.
7. All markings shall be clearly identified and color coded for the painter to identify.

3.3 SUBBASE

A. The synthetic track surfacing system shall be laid on an approved subbase. The General Contractor shall provide compaction test results of 95% or greater for the installed subbase and asphalt surface.

B. For NCAA and IAAF certification the following criteria must be followed: The track surface, i.e. asphalt substrate, shall not vary from planned cross slope by more than .1% with a maximum lateral scope outside to inside of 1% and maximum slope of 0.1% in any running direction. The finished asphalt shall not vary under a 10' straightedge more than 1/8".

C. It should be the responsibility of the asphalt paving contractor to flood the surface immediately after the asphalt is capable of handling traffic, but within 24 hours. If, after 20 minutes of drying time, there are birdbaths evident, it shall be the responsibility of the Engineer, in conjunction with the surfacing contractor, to determine the method of correction. No cold tar patching, skin patching or sand mix patching will be acceptable.

D. Any oil spills (hydraulic, diesel, motor oil, etc.) must be completely removed and replaced with either polyurethane or new, keyed in asphalt. The minimum curing time for the asphalt base is 28 days. It shall be the responsibility of the surfacing contractor to determine if the asphalt substrate has cured sufficiently prior to the application of the polyurethane surfacing system.

E. It shall be the responsibility of the general contractor to determine if the asphalt substrate meets all design specifications, i.e. cross slopes, planarity and specific project criteria. After all the above conditions are met, the synthetic surfacing contractor must, in writing, accept the planarity of the asphalt receiving base, before work can commence.

3.4 THICKNESS

A. Total thickness of the BSS-100 and BSS-300 synthetic track surfacing system shall average 12-13mm by Beynon Sports Surfaces.

3.5 EQUIPMENT

A. The BSS-100 and BSS-300 synthetic track surfacing system, or approved components shall be processed and installed by specially designed machinery with automatic electronic portioning, which provides continuous mixing, feeding and finishing for accurate quality-controlled installation.

B. No hand mixing will be allowed.

3.6 MATERIALS

A. BSS-300:

1. Base Course: The SBR granules and BEYPUR 300 shall be mixed together on site to regulate the ratio/quantity of SBR, not to exceed 82% in the base mat portion of the system. The BEYPUR 300 shall be mixed with the SBR rubber so that a minimum of 20%, by weight, exists in the final mixture. This mixture is then mechanically installed using the paver.
2. Seal Coat: The two BEYPUR 200 components are mixed at the prescribed ratio homogeneously with a suitable mixing device. The coating is squeegee applied to the base mat, making it impermeable.
3. Wearing Course: The 1 to 3mm EPDM granules shall be integrated into the BEYPUR to achieve the full depth of the 5 mm wearing course. The resilient embedded textured finish shall be a dense matrix of exposed EPDM granules. The homogeneous wearing course shall be applied in situ with the base course.

B. BSS-100:

1. Base Course: The SBR granules and BEYPUR shall be mixed together on site to regulate the ratio/quantity of SBR, not to exceed 82% by weight in the base mat portion of the system. The single component polyurethane binder shall be mixed with the SBR rubber so that a minimum of 20%, by weight, exists in the final mixture. This mixture is then mechanically installed using the paver.
2. Wearing Course: The 0.5 to 1.5 millimeter EPDM granules shall be mixed with BEYPUR, the single-component structural spray coating. The structural spray shall be made in two (2) uniform applications.

3.7 SITE CONDITIONS

A. Installation shall not take place if adjacent or concurrent construction generates excessive dust, abrasives or any other byproduct that, in the opinion of the installer, would be harmful to the track material, until completion of such works.

B. If, in the opinion of the installer of the synthetic material, the weather and/or climatic conditions are detrimental to the proper installation of the surfacing materials, work shall be delayed until conditions are acceptable. Preferred installed temperature is 50 degrees Fahrenheit and rising. Installation shall be executed only in dry conditions.

3.8 LINE MARKINGS AND SYMBOLS

A. All line and event markings shall be applied by experienced personnel utilizing polyurethane based paint comparable with the synthetic track surfacing. All marking dimensions shall be certified in accordance with the specifications issued by the appropriate sanctioning or governing body such as IAAF, NCAA, NFSHSA, etc.

1. All lanes and lines shall be white 2” wide lines.
2. All starts and finishes shall be 2” wide lines.
3. Exchange zones shall be indicated with triangles with a 41” base and 24” high with the base as the limits of the zone.
4. Acceleration marks shall be a 2” wide by 4” long dash marked clearly in the center of the lane.
5. Hurdle marks shall be 2” x 2” tic marks on the lane line on both sides of the lane.
6. Lane numbers shall be not less than 42” high and located as directed by the Engineer in four (4) locations. Numbers shall be in two (2) colors (shadowed background as selected by the Owner).
7. Event identification shall be 4” letters stenciled below and to the right of each lane and mark.
8. Scratch lines for the jumping events shall be 8” wide.
9. All starts and finished shall be clearly marked with the start of the said events. All symbols shall have the proper color code for the event.
10. Check marks for the pole vault event shall be at 12” intervals. Check mark dimensions shall be 1” x 6”.

3.9 PAINTING

A. No painting shall be performed when the velocity of the wind exceeds twelve miles per hour (12 mph), unless the spray equipment is equipped with the proper air curtains.

B. See following sheet for marking color selections for red surfaces.

C. Alternate colors recommended by the surface supplier shall be reviewed by the Owner prior to painting.

D. Contact the Athletic Department and verify all markings prior to installation.

3.10 CERTIFICATION

A. Upon completion of the installation, the owner shall be supplied with all necessary computations and drawings as well as a letter of certification attesting to the accuracy of the markings.

3.11 WARRANTY

A. Both synthetic track surfacing systems shall be fully guaranteed against faulty workmanship and material failure for a period of five (5) years from the date of acceptance.

B. Synthetic surfacing material found to be defective as a result of faulty workmanship and/or material failure shall be replaced or repaired at no charge, upon written notification within the guarantee period.

END OF SECTION 321216.20

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes concrete paving including the following:

1. Curbs and gutters.
2. Walks.

1.2 ACTION SUBMITTALS

A. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.3 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

1.4 PRECONSTRUCTION TESTING

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

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from as-drawnsteel wire into flat sheets.

C. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

D. Reinforcing Bars: ASTM A615/A615M, Grade 60; deformed.

E. Joint Dowel Bars: ASTM A615/A615M, Grade 60 plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A767/A767M, Class I coating. Cut bars true to length with ends square and free of burrs.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place.

Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

2.3 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C150/C150M, gray portland cement Type I.
2. Fly Ash: ASTM C618, Class C.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, portland blast-furnace slag cement.

B. Normal-Weight Aggregates: ASTM C33/C33M, Class 4S, uniformly graded. Provide aggregates from a single source.

C. Air-Entraining Admixture: ASTM C260/C260M.

D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

E. Water: Potable and complying with ASTM C94/C94M.

2.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Axim Italcementi Group, Inc., Caltexol CIMFILM.
b. BASF Construction Chemicals, LLC; Confilm.
c. ChemMasters; Spray-Film.
d. Conspec by Dayton Superior, Aquafilm.
e. Dayton Superior Corporation, Sure Film (J-74).
f. Edoco by Dayton Superior, BurkeFilm.
g. Euclid Chemical Company (The), an RPM company. Eucobar.
h. Kaufman Products, Inc. VaporAid.
i. Lambert Corporation; LAMBCO Skin.
j. L&M Construction Chemicals, Inc. E-CON.
k. Meadows, W.R., Inc. EVAPRE.
l. Metalcrete Industries, Waterhold.
m. Nox-Crete Products Group, MONOFILM.
n. Sika Corporation, Inc. SikaFilm.
o. SpecChem, LLC; Spec Film.

p. Symons by Dayton Superior; Finishing Aid.
q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
r. Unitex; PRO-FILM.
s. Vexcon Chemicals Inc.; Certi-Vex EnvioAssist.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.

1. Anti-Hydro International, Inc.; A-H Curing Compound #2 DR WB.
2. ChemMasters; Safe-Cure Clear.
3. Conspec by Dayton Superior; D.O.T. Resin Cure.
4. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W)
5. Edoco by Dayton Superior; DSSCC Clear Resin Cure.
6. Euclid Chemical Company (The), an RPM company; Kurez W VOX.
7. Kaufman Products, Inc.; Thinfilm 420.
8. Lambert Corporation; AQUA KURE – CLEAR.
9. L&M Construction Chemicals, Inc.; L&M CURE R.
10. Meadows, W.R., Inc. 1100-CLEAR SERIES.
11. Nox-Crete Products Group; Resin Cure E.
12. SpecChem, LLC; PaveCure Rez.
13. Symons by Dayton Superior, Resi-Chem Clear.
14. Tamms Industries, Inc., Euclid Chemical Company (The); TAMMSCURE WB 30C.
15. TK Products; Division of Sierra Corporation; TK-2519 WB.
16. Vexcon Chemicals Inc.; Certi-Vex Enviocure 100.

F. White, Waterborne Membrane-Forming Curing Compound: ASTM C309, Type 2, Class B, dissipating.

1. Anti-Hydro International, Inc.; A-H Curing Compound #2 WP WB.
2. ChemMasters; Safe-Cure 2000.
3. Conspec by Dayton Superior; D.O.T. Resin Cure White.
4. Dayton Superior Corporation, Day-Chem White Pigmented Cure (J-10-W)
5. Edoco by Dayton Superior, Resin Emulsion Cure V.O.C. (Type 11).
6. Euclid Chemical Company (The), an RPM company. Kurez VOX White Pigmented.
7. Kaufman Products, Inc. Thinfilm 450.
8. Lambert Corporation; AQUA KURE - WHITE.
9. L&M Construction Chemicals, Inc. L&M CURE R-2.
10. Meadows, W.R., Inc. 1100-WHITE SERIES.
11. SpecChem, LLC; PaveCure Rez White.
12. Symons by Dayton Superior; Resin-Chem White.
13. Vexcon Chemicals Inc.; Certi-Vex Enviocure White 100.

2.5 RELATED MATERIALS

A. Joint Fillers: ASTM D1751, asphalt-saturated cellulosic fiber in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

2.6 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Pozzolan: 25 percent.
2. Slag Cement: 50 percent.
3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content, 1-1/2 inch Nominal Maximum Aggregate Size: 5-1/2 percent plus or minus 1-1/2 percent.

D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

E. Concrete Mixtures: Normal-weight concrete.

1. Compressive Strength (28 Days): 4000 psi.
2. Maximum W/C Ratio at Point of Placement: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inch.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 INSTALLATION OF STEEL REINFORCEMENT

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

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed paving surface with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-

finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

3.8 SPECIAL FINISHES

A. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:

1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
2. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.

3.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to 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.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by curing compound unless otherwise approved by the engineer.

3.10 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-feet- long; unleveled straightedge not to exceed 1/2 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.11 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Hot-applied joint sealants.
3. Cold-applied, fuel-resistant joint sealants.
4. Hot-applied, fuel-resistant joint sealants.
5. Joint-sealant backer materials.
6. Primers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Concrete pavement joint sealants.
2. Joint-sealant backer materials.

B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of joint sealant.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Entity that employs installers and supervisors who are trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backer materials, 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.

2.2 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D5893/D5893M, Type NS.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Crafco Inc.; RoadSaver Silicone.
b. Pecora Corporation; 301 NS.
c. The Dow Chemical Company; Dow Corning 888 Silicone Joint Sealant.

B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D5893/D5893M, Type

SL.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Crafco Inc.; RoadSaver Silicone SL.
    b. Pecora Corporation; 300 SL.
    c. The Dow Chemical Company; Dow Corning 890-SL Silicone Joint Sealant.

C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Use T.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Pecora Corporation; UrexpanNR-200.

2.3 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant, Type I, II, or III: ASTM D6690.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. W.R. Meadows, Inc; Sealtight 3405.
    b. Right Pointe; D-3405 Hot Applied Sealant.

2.4 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or

migration onto adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backers to support joint 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 joint-sealant backer materials.
2. Do not stretch, twist, puncture, or tear joint-sealant backer materials.
3. Remove absorbent joint-sealant backer materials that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backer material installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants in accordance with the following requirements 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 joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.3 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

END OF SECTION 321373

SECTION 321713 - PARKING BUMPERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Precast concrete wheel stops.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Precast concrete wheel stops.

PART 2 - PRODUCTS

2.1 PARKING BUMPERS

A. Precast Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete; 4000-psi minimum compressive strength; manufacturer's standard height and width by 72 inches long. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate.

1. Surface Appearance: Smooth, free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
2. Surface Sealer: Manufacturer's standard salt-resistant, clear sealer, applied at precasting location.
3. Mounting Hardware: Galvanized-steel hardware as standard with wheel-stop manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wheel stops in accordance with manufacturer's written instructions unless otherwise indicated.

B. Install wheel stops in bed of adhesive before anchoring to substrate.

C. Securely anchor wheel stops to substrate with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

D. Verify that pavement is in suitable condition to begin installation in accordance with manufacturer's written instructions.

END OF SECTION 321713

SECTION 321723.28 - INFILLED SYNTHETIC TURF SYSTEM

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. The work under this section shall consist of furnishing all labor, materials, and equipment necessary to install, in place, all synthetic turf and other materials as indicated on the plans and as specified herein. The installation of all new materials shall be performed in strict accordance with these specifications, the turf provider's instructions and in accordance with all details and shop drawings.

1.3 SUBMITTALS

A. Substitutions: Not permitted.

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

1. Submit catalog cuts, material safety data sheets (MSDS), brochures, specifications, preparation and installation instructions and recommendations.
2. All supplied and installed materials and products will meet or exceed the minimum specifications designated in this section. Sufficient data must be submitted to indicate compliance with the contract documents.
3. Submit instructions for installation.

C. Test Results: The following test results, certified by a licensed independent testing laboratory, shall be submitted as outlined below

1. With the bid - mandatory and minimum specifications as shown in Part 2. Bids not meeting the minimum specifications will be rejected.
2. Upon completion of the installation of the infill (including anti-static applications) - Installer supervisor must measure and record infill depth using a depth tester for turf and tracks with analog or digital readouts. At ten separate field locations, three data points should be recorded by measuring the infill depth in a triangular pattern approximately 12"-18" apart. At each of the ten testing locations, the three data points should be averaged. Any location that does not measure 1.46" in depth or more must be corrected.
3. At completion of the project - dynamic cushioning test according to ASTM F-355-95, Procedure A and Standard F-1936-98 only if the finished product is to be used for American Football.

D. Shop Drawings: Show fabrication and installation details for synthetic turf, including, but not limited to:

1. Proposed locations of all seams in fabric surfacing. Show installation methods and construction.
2. Field lining and marking - Submit a complete scale and dimensional drawing of inlaid or tufted-in field lines and marking boundaries. Include graphics for end

zones and center logo artwork for approval as well.

3. All submittals shall be approved within 14 days after Notice to Proceed.

E. The turf manufacturer shall provide the following samples of the artificial turf selected for this project:

1. An 8.5"x11" minimum sample of the exact synthetic turf and infill system that is specified for this project.
2. Infill mix in accordance with product specifications.

F. Turf Manufacturer Certificates: Certified list of fifty (50) existing installations of a synthetic turf and infill system within the last three years, including owner representative and telephone number, attesting compliance with quality assurance information. All must be located within the United States.

G. With the bid - Proof that the turf manufacturer is a member, in good standing, of the Synthetic Turf Council.

H. With the bid - Sample Warranty: Provide a sample pre-paid third party insured warranty with the bid. Policy must be in force at the time of the bid.

1. The contractor shall provide a warranty to the owner that covers the defects in materials and installation workmanship of the turf for a period of eight (8) years from the date of substantial completion. The turf provider must verify that their representative has inspected the installation and that the work conforms to the turf provider's requirements and any written directives. The warranty shall include general wear and damage caused from UV degradation. Other items that must be addressed include the following:

a. Acceptable uses for the field
b. Fading
c. Color match within specification
d. Excessive fiber wear
e. Wrinkling and panel movement
f. Shock absorbency (Gmax)
g. Seam integrity
h. Drainage (through the turf only)

2. Exclusions shall include the following:

a. Vandalism
b. Acts of God

3. The warranty shall be fully third-party insured for the entire 8-year term and be non-prorated. Warranties that include language which pro-rates benefits shall cause the provider's bid to be rejected. Prior to final payment for the synthetic turf, the contractor shall submit to the owner, this policy guaranteeing the warranty to the owner. Insurance must reflect the following values:

a. $5,000,000 per each insured warranty
b. $5,000,000 annual aggregate for all warranties issued during each 12-month period of the 8-year warranty.
c. Policies that are backed by a Letter of Credit are not acceptable
d. Policy must be issued by an A-rated or greater A.M. Best Rating
e. Policies that include self-insurance or self-retention clauses shall not be

considered. Policy can not include any form of deductible amount. Policy must be in force at the time of bid.

I. With the bid - Turf manufacturer must attest that their submitted products infringe on no known patents.

J. Maintenance and Operations Data: At the completion and acceptance of the project, submit 3 complete sets, in manual form, of all the turf provider's recommended procedures and materials for, but not limited to general maintenance, line/marking installation, small repair procedures, cleaning, etc.

K. Project Record Documents: Record actual locations of seams, drains, and other pertinent information in accordance with the general requirements.

1.4 QUALITY ASSURANCE

A. Turf Manufacturer Qualifications:

1. Shall be experienced in the installation of synthetic infill grass (including in-house factory extruded fiber) for a minimum of five (5) years.
2. Shall have a minimum of 500 full sized tall fiber infilled type field installations. Field size to be a minimum of 65,000 square feet to qualify. This list is to be provided with the bid.
3. Shall provide third-party certification confirming compliance with referenced standards.
4. Turf manufacturer must formulate and produce its own fiber master batch.

B. Installer Qualifications:

1. Installation team shall be an established, insured installation firm experienced as a premium turf installer with suitable equipment and supervisory personnel, with a minimum of five years' experience with 15-foot-wide tufted materials.
2. Installation team shall be trained and certified, in writing, by the turf manufacturer, as competent int he installation of the specified material, including seaming and proper installation off the infill mixture.
3. Site superintendent shall have at least 10 installations that are similar to this type of tall fiber synthetic turf system.

C. All components and their installation method shall be designed and manufactured for use on outdoor athletic fields. The materials as hereinafter specified, should be able to withstand full climatic exposure, be resistant to insect infestation, rot, fungus and mildew; to ultraviolet light and heat degradation, and shall have the basic characteristic of flow-through drainage allowing free movement of surface run-off through the turf and directly into prepared granular base and into the field drainage system. The synthetic turf and components shall be of national reputation. THe turf fabric shall be installed by factory-authorized and certified technicians.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit synthetic turf work to be performed according to Contractor or Turf Provider’s written instructions and warranty requirements.

B. Field Measurements: Indicate measurements on Shop Drawings.

1.6 WARRANTY

A. Special warranty for American Football: Turf must maintain an ASTM F 355 Gmax of less than 165 for the life of the warranty. This is for the entire warranty period of eight (8) years.

1.7 MAINTENACE SERVICE

A. Turf Installation Contractor shall train maintenance staff and/or contracted maintenance staff in the use of the recommended maintenance equipment and provide maintenance guidelines to the facility maintenance staff.

PART 2 - PRODUCTS

2.1 ACCEPTABLE TURF MANUFACTURER

A. Pre-Approved turf manufacturer: AstroTurf Corporation - AstroTurf Rhino Blend 46.

2.2 TURF MATERIALS

A. Asphalt Synthetic Turf System: A complete synthetic turf system consisting of a combination of 10,400 denier monofilament fibers made from a singularly extruded combination of stabilized polyethylene and nylon polymers with proper compatibilizers and 10,000 denier parallel slit film fibers. Pile height shall be nominal 2.0”. Fibers shall be tufted to a primary backing and a mechanically applied adhesive secondary backing.

1. The tufted fiber's face weight shall not weigh less than 46 ounces per square yard. The tufted rows of fiber are to be spaced no more than 3/8" apart. ASTM tests proving the fiber meets these qualifications must be provided with the bid. Turf systems that do not meet this specification will be disqualified.
2. The carpet's primary backing shall have a minimum weight of 6.7 oz per square yard. The carpet shall then be coated with a secondary backing of polyurethane synthetic coating material with a minimum application rate of 20 oz per square yard and then perforated for adequate drainage. Carpets that are not perforated for adequate drainage shall not be accepted.
3. The carpet shall be delivered in 15' wide rolls. The rolls shall be of sufficient length to go from sideline to sideline. Head seams, other than at sidelines, will not be acceptable.

B. The infilled pile surface shall provide good traction in all types of weather with the use of conventional sneaker type shoes, composition molded sole athletic shoes, and screw- in style football cleats.

C. The pile surface shall be suitable for both temporary and permanent line markings using acrylic paint, as per the turf provider’s recommendations.

D. All adhesives used in bonding the seams shall be resistant to moisture, freeze/thaw, bacteria and fungus attacks, and resistant to ultraviolet radiation. The adhesive shall be made especially for the adhesion of synthetic turf seams and inlaid field markings and graphics.

E. The seam specific adhesive system shall have been utilized on at least 25 full installations. Provide this information with the bid. It shall consist of a factory-made

adhesive bed applied to a non-woven fabric seaming tape. The adhesive bed shall be a metered amount suitable for the application. It shall be heat and pressure activated. A special heat application machine and pressure application using weighted rollers is mandatory.

F. Supply field groomer and sweeper or single maintenance apparatus that performs both basic maintenance functions.

G. Perimeter edge details required for the system shall be as detailed and recommended by the turf provider, and as approved by the turf provider.

2.3 TURF FABRIC SURFACE

A. The pile surface shall resemble freshly mown natural grass in appearance, texture and color.

B. The pile surface shall be nominally uniform in length.

C. The pile fiber angle shall be 90 degrees ± 15 degrees, measured from the horizontal after installation of the infill material.

D. The entire system shall be resistant to weather, insects, rot, mildew and fungus growth and will be non-allergic and non-toxic.

E. The synthetic turf system shall have a nominal fiber length of 2.0”.

F. Each roll shall be minimum 15’ wide

G. The entire system shall be constructed for porous standards as specified. Synthetic turf system shall be perforated at 4 – 6” on center. Systems that are not perforated for maximum drainage shall not be acceptable.

H. All markings shall be tufted in-place, inlaid or glued. It is recommended that the maximum amount of markings be factory-prefabricated into the turf system prior to shipment to site. At a minimum all football markings (with the exception of hash marks) shall be factory prefabricated.

2.4 PRODUCT SPECIFICATIONS – TURF

A. Face yarns shall be a proven athletic quality, outdoor stabilized monofilament made from a singularly extruded combination of stabilized polyethylene and nylon polymers with proper compatibilizers.

B. The Turf Blend shall be Rhino Blend 46.

C. The fabric shall possess the following minimum physical characteristics. ASTM testing shall be provided with the bid and any products not meeting the minimum physical characteristics will be rejected:

1. Average Pile Yarn Face Weight: ASTM D 5848; 46 oz/square yard
2. Average Total Weight: ASTM D 5848; 72.7 oz/square yard
3. Secondary Backing Weight: ASTM D 5848; 20 oz/square yard
4. Primary Backing Weight: ASTM D 5848; 6.7 oz/square yard
5. Average Tuft Length: ASTM D 5823; 2.0"
6. Tufting Gauge: ASTM D 5793; 3/8" maximum
7. Tuft Bind: ASTM D 1335; >8 lbs
8. Yarn Denier (monofilament fiber): ASTM D 1577; 10,400/6

9. Yarn Denier (slit film fiber): ASTM D 1577; 10,000/1
10. Fiber Thickness (Mono/slit-film): ASTM D 3218; 330/115 microns
11. Surface Flammability: ASTM D 2859; TEST PASSED
12. Permeability: ASTM F 1551; >30 in/hr
13. Melt Point: ASTM D 789; 248 degrees Fahrenheit
14. Gmax System (American Football): ASTM F 355; <125 at installation, <165 over life of warranty

2.5 INFILL MATERIAL

A. Infill composition shall consist of a ballast layer of silica sand topped by ambient SBR rubber performance infill in a ratio by weight of 65% rubber / 35% sand.

B. Silica sand infill:

1. Must be clean, sub-angular silica sand
2. Must be 20-40 sieve size

C. SBR infill:

1. Must be ambient SBR Rubber
2. Must be 10-20 sieve size

D. Immediately after infill layers are installed, infill depth must be measured per testing protocol detailed in Section 1.3 C. 2 above to ensure that infill layer is at least 1.2” deep.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of the synthetic turf, examine substrates and conditions, with Installer present, for compliance with requirements for visual installation tolerances. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Certification of prior work: The synthetic turf manufacturer and / or certified installation contractor shall perform a visual inspection of the field base onto which the synthetic turf system is to be installed and to examine the finished surface for required compaction, and grade tolerances (through string line testing). After any discrepancies between the required materials, application and tolerance requirements noted have been corrected, the synthetic turf installer should submit a written certification of VISUAL acceptance of the base for installation of the synthetic turf system. Any tests other than VISUAL tests (string line, water hose, etc…) shall be the responsibility of the General Contractor, Architect, Engineer, or Sports Field Consultant.

C. Installation of all materials shall be performed in full compliance with approved project shop drawings. Only factory trained and certified technicians skilled in the installation of athletic caliber synthetic turf systems, working under the direct supervision of the turf manufacturer’s project managers, shall undertake the placement of the turf system. The designated supervisory personnel on the project must be certified, in writing by the turf provider as competent in the installation of these materials, including proper seaming and proper installation of the infill mixture. The turf provider shall certify the installation and warranty compliance.

3.2 PREPARATION

A. Inspect delivered field surface fabric and components immediately prior to installation. Any damaged or defective items shall be rejected. Installed synthetic turf system shall be inspected for, but not limited to, the following:

1. Uniformity of product and color
2. Surface Wrinkles
3. Field Markings
4. Field Edge Installation
5. Pile height of each roll shall be measured. Any material(s) that does not meet minimum height and thickness specifications shall be rejected. Pile height shall be measured in its finished positions.

B. Environmental Conditions: Weather conditions are important for the successful installation of the systems. No work under this section will proceed when:

1. Ambient temperatures are below 45 degrees F
2. Material temperatures are below 45 degrees F
3. Surfaces are wet or damp
4. Rain is imminent or falling
5. Conditions exist or are imminent, which will be unsuitable to installation requirements of the systems specified herein. Humidity levels will be inside the limits of recommended by the adhesive manufacturer to obtain optimal bonding characteristics of the surfaces.

3.3 INSTALLATION OF THE SYNTHETIC TURF

A. The full width rolls shall be laid out across the field. When all of the rolls of the playing surface have been installed, the sideline areas will be installed at right angles to the playing field turf. All seam widths are to be held to a minimum and shall be traverse to the field direction. Seams shall be flat, tight, and permanent with no separation or fraying. All seams shall remain as required for the duration of the warranty period.

B. The perimeter of the field shall be firmly secured to the edge anchors for the life of the warranty and in accordance to project details.

C. Resilient Infill:

1. The sand ballast infill material shall be spot inspected and tested for conformance to sieve specifications.
2. Sand ballast infill must be placed in such a way as to minimize fiber entrapment.
3. The rubber infill must be uniformly applied so as to ensure uniform, predictable surface.
4. After infill layers are installed, infill depth must be measured to ensure that infill depth is at least 1.46" deep.

3.4 FIELD LINING AND MARKINGS

A. All markings shall be installed in accordance with prior approved project Shop Drawings.

B. Inlays shall conform to the turf manufacturer’s specifications, directions, and recommendations for the best results.

C. Striping layouts shall be accurately measured by the Contractor before installation of inlaid field markings

D. Install inlays only when the surface is completely dry. Adhere all inlays securely into place. Never loose-lay and sew an inlay into place.

3.5 FIELD QUALITY CONTROL

A. Testing Agency - Contractor shall engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of completed applications of synthetic turf system shall take place in suggestive states, in areas of extent and using methods that are industry standard. Do not proceed with application of next stages until test results for previously completed applications show compliance.

C. Remove and replace items where test results indicate that it does not comply with specified requirements.

3.6 FINAL ACCEPTANCE

A. Upon final acceptance, the Manufacturer shall submit to the Owner three (3) copies of Maintenance Manuals, which will include all necessary instructions for the proper care and preventative maintenance of the synthetic turf system, including painting and striping.

B. The Manufacturer shall ensure that the turf can be plowed with Manufacturer approved snow removal equipment as detailed in the provided Maintenance Manuals.

C. The finished playing surface shall appear as mowed grass with no irregularities and shall afford excellent traction for conventional athletic shoes of all types. The finished surface shall resist abrasion and cutting from normal use.

3.7 CLEANING

A. Contractor shall provide the labor, supplies and equipment as necessary for final cleaning of surfaces and installed items. All usable remnants of new material shall become the property of the Owner. The Contractor shall keep the area clean throughout the project and clear of debris. Surfaces, recesses, enclosures, etc… shall be cleaned, as necessary, to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the Owner.

END OF SECTION 321723.28

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Chain-link fence framework.
2. Chain-link fence fabric.
3. Chain-link fittings.
4. Chain-link wires and ties.
5. Chain-link swing gates.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
    a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    b. Fence and gate posts, rails, and fittings.
    c. Chain-link fabric, reinforcements, and attachments.
    d. Gates and hardware.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, ground details, mounting, post spacing, and attachments to other work.

C. Samples for Initial Selection: For each type of factory-applied finish.

D. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:

1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.

E. Delegated Design Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For factory-authorized service representative.

B. Product Certificates: For each type of chain-link fence, and gate.

C. Product Test Reports: For framework strength in accordance with ASTM F1043, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Field quality-control reports.

E. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gate operators to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

B. Emergency Access Requirements: In accordance with requirements of authorities having jurisdiction for gates with automatic gate operators serving as a required means of access.

C. Mockups: Build mockups to set quality standards for fabrication and installation.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.8 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to comply with performance requirements.
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 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design chain-link fence and gate frameworks.

B. Structural Performance: Chain-link fence and gate frameworks are to withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated in accordance with ASCE/SEI 7.

1. Design Wind Load: 80mph or as indicated on drawings, whichever is greater.

a. Minimum Post Size: Determine in accordance with ASTM F1043 for post spacing not to exceed 10 feet.
b. Minimum Post Size and Maximum Spacing: Determine in accordance with CLFMI WLG 2445, based on mesh size and pattern specified.

2.2 CHAIN-LINK FENCES, GENERAL

A. CLFMI Publications: Comply with the CLFMI Product Manual unless modified by requirements in the Contract Documents.

B. Chain-Link Fence and Gate Assemblies: Include materials applicable for a complete assembly of application types, consisting of commercial, industrial, and security chain-link fences and gates.

1. Source Limitations: Obtain chain-link fence and gate components from single source or manufacturer.

2.3 CHAIN-LINK FENCE FRAMEWORK

A. Posts and Rails: ASTM F1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thicknesses in accordance with ASTM F1043 or ASTM F1083 based on the following:

1. Fence Height: As indicated on Drawings.
2. Light-Industrial-Strength Material: Group IC-L, round steel pipe, electric-resistance-welded pipe.
    a. Line Post: 2.375 inches in diameter.
    b. End, Corner, and Pull Posts: 2.875 inches.
3. Heavy-Industrial-Strength Material: Group IC, round steel pipe, electric-resistance-welded pipe.
    a. Line Post: 2.375 inches in diameter.
    b. End, Corner, and Pull Posts: 2.875 inches in diameter.
4. Horizontal Framework Members: Intermediate and top rails in accordance with ASTM F1043.
5. Metallic Coating for Steel Framework:
    a. Type A: Not less than minimum 2.0 oz./sq. ft. average zinc coating in accordance with ASTM A123/A123M or 4.0 oz./sq. ft. zinc coating in accordance with ASTM A653/A653M.
    b. Type B: Zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
    c. External, Type B: Zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil- thick, zinc-pigmented coating.
    d. Type C: Zn-5-Al-MM alloy, consisting of not less than 1.8 oz./sq. ft. coating.
    e. Coatings: Any coating above.
6. Polymer coating over metallic coating.
    a. Color: As selected by Architect from manufacturer's full range, in accordance with ASTM F934.

2.4 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of

outer edge of selvage knuckle or twist in accordance with "CLFMI Product Manual" and requirements indicated below:

1. Fabric Height: As indicated on Drawings.
2. Steel Wire for Fabric: Wire diameter of 0.148 inch.
    a. Aluminum-Coated Fabric: ASTM A491, Type I, 0.35 oz./sq. ft.
    b. Zinc-Coated Fabric: ASTM A392, Type II, Class 1, 1.2 oz./sq. ft. with zinc coating applied before weaving.
    c. Zn-5-Al-MM Aluminum-Mischmetal-Coated Fabric: ASTM F1345, Type III, Class 1, 0.60 oz./sq. ft..
    d. Polymer-Coated Fabric: ASTM F668, Class 1 over aluminum-coated steel wire.
        1) Color: As selected by Architect from manufacturer's full range, in accordance with ASTM F934.
    e. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.
3. Selvage: Twisted top and knuckled bottom.

2.5 CHAIN-LINK FITTINGS

A. Provide fittings in accordance with ASTM F626.

B. Post Caps: Provide for each post.
    1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:
    1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
    2. Rail Clamps: Line and corner boulevard clamps for connecting rails to posts.

E. Tension and brace bands, tension bars, and truss rod assemblies: In accordance with ASTM F2611.

F. Tie Wires, Clips, and Fasteners: In accordance with ASTM F626.
    1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, in accordance with the following:
        a. Aluminum: ASTM B211/B211M; Alloy 1350-H19; 0.148-inch- diameter, mill-finished wire.

G. Finish:
    1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.
        a. Polymer coating over metallic coating.
    2. Aluminum: Mill finish.

2.6 CHAIN-LINK SWING GATES

A. General: ASTM F900 for gate posts and double swing gate types.

1. Gate Leaf Width: As indicated.
2. Framework Member Sizes and Strength: Based on gate fabric height as indicated.

B. Swing Gate Pipe and Tubing:

1. Swing Gate Posts: Round tubular steel.
2. Gate Frames and Bracing: Round tubular steel.
3. Zinc-Coated Steel: ASTM F1043 and ASTM F1083; manufacturer's standard protective coating and finish.

C. Swing Frame Corner Construction: assembled with corner fittings.

D. Swing Gate Hardware:

1. Hinges: 360-degree inward and outward swing.
2. Lock: Manufacturer's standard internal device.

2.7 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a certified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION OF CHAIN-LINK FENCES

A. Install chain-link fencing in accordance with ASTM F567 and more stringent requirements specified.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
    a. Posts Set into Holes in Concrete: Form or core drill holes not less than 5 inches deep and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed in accordance with anchoring material manufacturer's written instructions. Finish anchorage joint to slope away from post to drain water.
3. Mechanically Driven Posts: Drive into soil to depth of 36 inches. Protect post top to prevent distortion.

D. Terminal Posts: Install terminal end, corner, and gate posts in accordance with ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.

E. Line Posts: Space line posts uniformly at 10 feet o.c.

F. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

3.4 INSTALLATION OF GATES

A. Install gates in accordance with manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

3.5 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION 323113

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes planting soils specified by composition of the mixes.

B. Related Requirements:

1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
2. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
3. Section 329300 "Plants" for placing planting soil for plantings.

1.2 DEFINITIONS

A. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

B. Imported Soil: Soil that is transported to Project site for use.

C. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.

D. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

E. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

F. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

G. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

H. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

I. USCC: U.S. Composting Council.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each bulk-supplied material, 1-quart volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Contractor to engage an independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

PART 2 - PRODUCTS

2.1 PLANTING SOILS SPECIFIED BY COMPOSITION

A. Planting-Soil Type: Existing, on-site surface soil, with the duff layer, if any, retained; and stockpiled on-site; modified to produce viable planting soil. Blend existing, on-site surface soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:

1. Ratio of Loose Compost to Soil: 1:4 by volume.
2. Ratio of Loose Sphagnum Peat to Soil: 1:4 by volume.

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.
2. Class: O, with a minimum of 95 percent passing through a No. 8 sieve and a minimum of 55 percent passing through a No. 60 sieve.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.

F. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C33/C33M.

2.3 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:

1. Feedstock: May include animal waste.
2. Reaction: pH of 5.5 to 8.
3. Soluble-Salt Concentration: Less than 4 dS/m.
4. Moisture Content: 35 to 55 percent by weight.
5. Organic-Matter Content: 40-60 percent of dry weight.
6. Particle Size: Minimum of 98 percent passing through a 1-inch sieve.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.

C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 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. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

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.

PART 3 - EXECUTION

3.1 GENERAL

A. Place planting soil and fertilizers according to requirements in other Specification Sections.

B. 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 planting soil.

C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

A. Excavation: Excavate soil from designated area(s) to a depth of 6 inches and stockpile until amended.

B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.

C. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.

D. Screening: Pass unamended soil through a 3-inch sieve to remove large materials.

3.3 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply and mix unamended soil with amendments on-site to produce required

planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

C. Mixing: Spread unamended soil to total depth of 4 inches, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.

1. Amendments: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.

a. Mix lime sulfur with dry soil before mixing fertilizer.
b. Mix fertilizer with planting soil no more than seven days before planting.

2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches in loose depth for material compacted by compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698 and tested in-place.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 BLENDING PLANTING SOIL IN PLACE

A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Preparation: Till unamended, existing soil in planting areas to a minimum depth of of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

C. Mixing: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.

1. Mix lime and sulfur with dry soil before mixing fertilizer.
2. Mix fertilizer with planting soil no more than seven days before planting.

D. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.5 APPLYING COMPOST TO SURFACE OF PLANTING SOIL

A. Application: Apply compost component of planting-soil mix to surface of in-place

planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Soil will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.7 PROTECTION

A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.

3.8 CLEANING

A. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

END OF SECTION 329113

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

1. Hydroseeding.
2. Turf renovation.

B. Related Requirements:

1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.2 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. See Section 329113 "Soil Preparation" and drawing designations for planting soils.

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.

1.3 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.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.5 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 National Association of Landscape Professionals or AmericanHort.
2. Experience: Three 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 National Association of Landscape Professionals:

    a. Landscape Industry Certified Technician - Exterior.
    b. Landscape Industry Certified Lawn Care Manager.
    c. Landscape Industry Certified Lawn Care Technician.

5. Pesticide Applicator: State licensed, commercial.

1.6 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. 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.

1.7 FIELD CONDITIONS

A. Planting Restrictions: 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: State-certified seed of grass species as listed below for

solar exposure.

2. Quality, Non-State Certified: Seed of grass species as listed below for solar

2.2 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:

a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

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.

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 hydromulching 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. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."

3.4 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.

I. Apply initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.

1. Initial Fertilizer: Commercial 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.

3.5 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.

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 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:

D. Turf Postfertilization: Apply commercial fertilizer after initial mowing and when grass is dry.

3.6 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. and bare spots not exceeding 5 by 5 inches.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.7 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.

3.8 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.

3.9 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.

END OF SECTION 329200

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. 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.

1.2 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.

1.3 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports: Percolation tests for tree pits. Include the following:

1. Tree identification number matching the plans.
2. Date of test.
3. Time when water was added to tree pit to start percolation test.
4. Time with photo documentation showing increments of testing with water level in tree pit.
5. Identification of tester.

B. Qualification Statements: 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.

C. Product Certificates: For each type of manufactured product, from manufacturer, and complying with manufacturer's certified analysis of standard products.

D. Pesticides and Herbicides: Product label and manufacturer's written application instructions specific to Project.

E. Sample Warranty: For special warranty.

1.4 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.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in

successful establishment of plants.

1. Experience: Three years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
2. Installer's Field Supervision: Maintain an experienced full-time supervisor on Project site when work is in progress.
3. Personnel Certification: Installer's field supervisor certified in one of the following categories from the National Association of Landscape Professionals:
    a. Landscape Industry Certified Technician - Exterior.
    b. Landscape Industry Certified Interior.
    c. Landscape Industry Certified Horticultural Technician.
4. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

C. Measurements: Measure in accordance with 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 above the root flare for trees up to 4-inch caliper size, and 12 inches 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.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

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; with tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); with crossing trunks; with cut-off limbs more than 3/4 inch 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 in accordance with ANSI Z60.1.

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 plant.

2.2 FERTILIZERS

A. Granular 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:

a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and maximum of 5.5 percent inert material.

2.3 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers inert to biological degradation and naturally resistant to chemicals, alkalis, and acids, formed into a stable network so that fibers retain their relative position.

B. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd..

2.4 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 maximum, 1/2 inch minimum.
3. Color: Natural.

2.5 HERBICIDES AND PESTICIDES

A. 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.

B. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

C. Pesticides: Registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended in writing 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.

2.6 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
2. Wood Deadmen: Timbers measuring 8 inches in diameter and 48 inches long, treated with specified wood pressure-preservative treatment.
3. Guys and Tie Wires: ASTM A641/A641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.
4. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
5. Guy Cables: Five-strand, 3/16-inch- diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.
6. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

B. Root-Ball Stabilization Materials:

1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated; stakes pointed at one end.
2. Wood Screws: ASME B18.6.1.

2.7 MISCELLANEOUS PRODUCTS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix in accordance with manufacturer's written instructions.

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

moisture content reaches acceptable levels to attain 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 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.

3.3 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil in accordance with Section 329113 "Soil Preparation."

B. Placing Planting Soil: Blend planting soil in place.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate in accordance with manufacturer's written instructions.

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 at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
3. Do not excavate deeper than depth of root ball, measured from the root flare to the bottom of root ball.
4. If area under the plant was initially dug too deep, add soil to raise it to correct level and thoroughly tamp the added soil to prevent settling.
5. 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.
6. Maintain supervision of excavations during working hours.
7. Keep excavations covered or otherwise protected overnight.

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.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball in accordance with ANSI Z60.1. If root flare is not visible, remove soil in a level manner from root ball to where the top-most root emerges from the trunk. After soil removal to expose 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. Bare-Root Stock: Set and support each plant in center of planting pit or trench with root flare 1 inch above adjacent finish grade.

1. Backfill: Planting soil. For trees, use excavated soil for backfill.
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. Distribute granular fertilizer around each planting pit when pit is approximately one-half filled. Do not place in bottom of the hole or touching the roots.
6. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. 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 root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of root ball.

3.6 MECHANIZED TREE-SPADE PLANTING

A. Plant trees with approved mechanized tree spade at designated locations. Do not use tree spade to move trees larger than maximum size allowed for similar field-grown, balled-and-burlapped, root-ball diameter in accordance with ANSI Z60.1, or trees larger than manufacturer's maximum size recommendation for tree spade being used, whichever is smaller.

B. Use same tree spade to excavate the planting hole as will be used to extract and transport the tree.

C. When extracting tree, center the trunk within the tree spade and move tree with solid ball of earth.

D. Cut exposed roots cleanly during transplanting operations.

E. Plant trees following procedures in "Tree, Shrub, and Vine Planting" Article.

F. Where possible, orient the tree in same direction as in its original location.

3.7 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 in accordance with 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.

3.8 INSTALLATION OF ROOT BARRIER

A. Install root barrier where trees are planted within 60 inches of paving or other hardscape elements, such as walls, curbs, and walkways, unless otherwise indicated on Drawings.

B. Align root barrier vertically, and run it linearly along and adjacent to paving or other hardscape elements to be protected from invasive roots.

3.9 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 as indicated on drawings 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 depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave 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.

3.10 INSTALLATION OF MULCHES

A. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees and Treelike Shrubs in Turf Areas: Apply organic mulch 3-inch coverage, with 36-inch radius around trunks or stems. Do not create a mulch cone or place mulch within 3 inches of trunks or stems.
2. Organic Mulch in Planting Areas: Apply 3-inch coverage over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.11 APPLICATION OF HERBICIDES AND PESTICIDES

A. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and

ground-cover areas in accordance with manufacturer's written instructions. Do not apply to seeded areas.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written instructions.

C. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and in accordance with manufacturer's written instructions. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

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 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Perform tree pit percolation tests.
2. Tree pit construction will be considered defective if it does not pass percolation tests and inspections.
3. Do not proceed with planting in tree pits until satisfactory percolation is demonstrated.

C. Prepare test and inspection reports.

3.14 REPAIR AND REPLACEMENT

A. 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 25 percent dead or in unhealthy condition before end of 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 4 inches or smaller in caliper size.
2. Provide one new tree(s) of 4-inch caliper size for each tree being replaced that measures more than 4 inches in caliper size.
3. Species of Replacement Trees: Species selected by Architect.

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 330500 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping joining materials.
2. Sleeves.
3. Identification devices.
4. Grout.
5. Piped utility demolition.
6. Piping system common requirements.
7. Equipment installation common requirements.
8. Concrete bases.
9. Metal supports and anchorages.

1.2 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Identification devices.

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.
    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.2 SLEEVES

A. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

2.3 GROUT

A. Description: ASTM C1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.
   3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

A. Refer to Section 024119 "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
   1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
   2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
   3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
   4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
   5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 INSTALLATION OF PIPING

A. Install piping according to the following requirements and utilities Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Sleeves are not required for core-drilled holes.

J. Permanent sleeves are not required for holes formed by removable PE sleeves.

K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

a. Pipe Sleeves: PVC. For pipes smaller than NPS 6.
b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

L. Verify final equipment locations for roughing-in.

M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written

instructions.

H. Soldered Joints: Apply ASTM B813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B32.

I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D2235 and ASTM D2661 appendixes.
3. CPVC Piping: Join according to ASTM D2846/D2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D1785, PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D2855.
5. PVC Nonpressure Piping: Join according to ASTM D2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D3138Appendix.

L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D3139.

M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D3212.

N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657.

1. Plain-End PE Pipe and Fittings: Use butt fusion.
2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 GROUTING

A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 330500

SECTION 331415 - SITE WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water distribution piping and related components.

B. Related Requirements:

1. Section 315000 “Excavation Support and Protection

1.2 ACTION SUBMITTALS

A. Product Data.

1.3 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service in accordance with requirements indicated:

1. Notify Engineer no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without Owner's written permission.

1.6 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.

B. Comply with standards of authorities having jurisdiction for domestic water-service piping, including materials, installation, testing, and disinfection.

C. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

D. Piping materials to bear label, stamp, or other markings of specified testing agency.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

F. Comply with ASTM F645 for selection, design, and installation of thermoplastic water piping.

G. Comply with FM Approvals' "Approval Guide" and/or UL's "Fire Protection Equipment Directory" for fire-suppression water-service products.

H. Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

I. All piping and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61/NSF 372 or are certified in compliance with NSF 61/NSF 372 by an ANSI-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PIPING MATERIALS

A. Comply with requirements in "Piping Applications" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and service sizes.

B. Potable-water piping and components comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

2.3 COPPER TUBE AND FITTINGS

A. Annealed Seamless Copper Tube: ASTM B88, Type K.

B. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

C. Cast-Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock-body, ball-and-socket, metal-to-metal seating surfaces; and solder-joint or threaded ends.

D. Wrought-Copper Unions: ASME B16.22.

2.4 PIPING JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series.

B. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.

C. Gaskets for Ferrous Piping and Copper-Alloy Tubing: ASME B16.21, asbestos free.

D. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.5 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating

at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.

1. Standard: AWWA C219.
2. Center-Sleeve Material: Manufacturer's standard.
3. Gasket Material: Natural or synthetic rubber.
4. Pressure Rating: 150 psig minimum.
5. Metal Component Finish: Corrosion-resistant coating or material.

C. Split-Sleeve Pipe Couplings: Metal, bolted, split-sleeve-type, reducing or transition coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners.

1. Standard: AWWA C227.
2. Sleeve Material: Manufacturer's standard.
3. Sleeve Dimensions: Of thickness and width required to provide pressure rating.
4. Gasket Material: O-rings made of EPDM rubber unless otherwise indicated.
5. Pressure Rating: 150 psig minimum.
6. Metal Component Finish: Corrosion-resistant coating or material.

D. Flexible Connectors:

1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.
2. Ferrous-Metal Piping: Stainless steel hose covered with stainless steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.

E. Dielectric Fittings: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

1. Dielectric Unions:
    a. Standard: ASSE 1079.
    b. Pressure Rating: 125 psig minimum at 180 deg F.
    c. End Connections: Solder-joint copper alloy and threaded ferrous.
2. Dielectric Flanges:
    a. Standard: ASSE 1079.
    b. Factory-fabricated, bolted, companion-flange assembly.
    c. Pressure Rating: 125 psig minimum at 180 deg F.
    d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
3. Dielectric-Flange Insulating Kits: Nonconducting materials for field assembly of companion flanges.
    a. Pressure Rating: 150 psig.
    b. Gasket: Neoprene or phenolic.
    c. Bolt Sleeves: Phenolic or PE.
    d. Washers: Phenolic with steel backing washers.

4. Dielectric Nipples:
    a. Standard: IAPMO PS 66.
    b. Electroplated steel nipple complying with ASTM F1545.
    c. Pressure Rating: 300 psig at 225 deg F.
    d. End Connections: Male threaded or grooved.
    e. Lining: Inert and noncorrosive, PP.

2.6 YARD HYDRANTS

A. Yard Hydrant: Woodford Manufacturing, Model Y95, Anti-Siphon Freezeless Yard Hydrant. Install per manufacturer's standards and specifications.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with excavating, trenching, and backfilling requirements in Section 312000 "Earth Moving."

3.2 PIPING APPLICATIONS

A. Transition couplings with pressure ratings at least equal to piping pressure rating may be used unless otherwise indicated.

B. Do not use flanges or unions for underground piping.

C. Flanges, unions, and grooved-end-pipe couplings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

D. Underground water-service piping NPS 3/4 to NPS 3 to be the following:
    1. Soft copper tube, ASTM B88, Type K; joints.

E. Underground water-service piping NPS 4 to NPS 8 to be the following:
    1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed for nonburied applications and mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints for buried applications.

3.3 PIPING SYSTEMS – COMMON REQUIREMENTS

A. Comply with Section 330500 "Common Work Results for Utilities" for piping-system common requirements.

B. Provide a continuous bare copper or aluminum tracer wire not less than 0.10 inch in diameter in sufficient length over each separate run of nonmetallic pipe.

3.4 INSTALLATION OF PIPING

A. Water-Main Connection:
    1. Arrange with utility company for tap of size and in location indicated in water main.
    2. Tap water main in accordance with requirements of water utility company and of size and in location indicated.

B. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve in accordance with MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

C. Make connections NPS 2 and smaller with drilling machine according to the following:

1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install manifold for multiple taps in water main.
6. Install curb valve in water-service piping with head pointing up and with service box.

D. Comply with NFPA 24 for fire-service-main piping materials and installation.

1. Install copper tube and fittings in accordance with CDA's "Copper Tube Handbook."

E. Install ductile-iron, water-service piping in accordance with AWWA C600 and AWWA M41.

F. Bury piping with depth of cover over top at least 5ft.

G. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

H. Extend water-service and fire-suppression water-service piping and connect to water-supply source and building water-piping and fire-suppression piping systems inside building in locations and pipe sizes indicated.

I. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.5 JOINT CONSTRUCTION

A. Comply with Section 330500 "Common Work Results for Utilities" for basic piping joint construction.

B. Make pipe joints according to the following:

1. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools and procedures recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.
2. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
3. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
4. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with

grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts in accordance with coupling manufacturer's written instructions.

5. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
    a. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
    b. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
    c. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.6 INSTALLATION OF ANCHORAGE

A. Anchorage: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
    1. Concrete thrust blocks.
    2. Locking mechanical joints.
    3. Set-screw mechanical retainer glands.
    4. Bolted flanged joints.
    5. Heat-fused joints.
    6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, and yard hydrant branches. Include anchorages for the following piping systems:
    1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: In accordance with AWWA C600.
    2. Fire-Service-Main Piping: In accordance with NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 INSTALLATION OF YARD HYDRANTS

A. Install yard hydrants in accordance with manufacturer's specifications and requirements.

3.8 CONNECTIONS

A. See Section 330500 "Common Work Results for Utilities" for piping connections to valves and equipment.

B. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve or connect as shown on the drawings.

C. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.9 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50 psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.10 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."

B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel. See Section 330500 "Common Work Results for Utilities" for identifying devices.

3.11 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for three hours.
    c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 330500

SECTION 334000 – SURFACE DRAINAGE SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular trench drain systems.

1.2 SYSTEM DESCRIPTION

A. System Type:

1. Sport drain sloping system shall employ an angled grade on both sides of a linear trench to move runoff into a point along the channel. Liquids shall be discharged by gravity flow at the end of the drain into an underground pipe system.
2. Sport drain neutral system shall provide ample hydraulics for track application.

B. System Design:

1. Modular trench drains shall be factory manufactured and engineered with compatible grates and accessory components in sizes and capacities to provide a complete functioning trench drain system.
2. Modular channels are aligned onsite via male/female interconnecting ends to form a continuous run. Systems shall provide a perimeter of drainage around running track/field

C. System Requirements:

1. Loading: Class A
2. Durability:
    a. Liquid Type: Water
    b. Grade surface adjacent to trench grate: As indicated on plans.
    c. Grate and trench materials shall resist Liquid Type attack and corrosion of trench drain components and grate.
3. User Requirements:
    a. Grate Finish: Type 495Q – gray longitudinal plastic
    b. Grate Safety Requirements:
        1) Grates shall comply with requirements of the Americans with Disabilities Act (ADA).
        2) Grates shall include a ‘heelsafe’ pattern in compliance with American Sociey of Mechanical Engineers (ASME) A112.6.3, Floor and Trench Drains. Section 7.12, “Heel Resistant Strainers and Grates”.
        3) Grates shall prevent small stiletto-style heels from getting stuck, causing injury or falls.
        4) Grates shall be bicycle-safe grates to avoid slot opening that trap modern bicycle wheels.
4. Hydraulic Performance:

a. Trench drain system shall provide drain performance without grate bypass occurring and without uncontrolled ponding during maximum design flow rate and duration.

1.3 SUBMITTALS

A. Product Data: Submit product data and installation instruction including manufacturer's product sheet, for specified products.

B. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.

C. Quality Assurance Submittals: Submit the following:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5-year experience manufacturing similar products.

B. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 01 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

B. Field Measurements: Verify actual measurements/openings by field measurements

before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.9 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty:

1. Warranty Period: 12 months commencing on Date of Substantial Completion or 24 months from date of purchase, whichever is sooner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

1. ACO, Inc.; 9470 Pinecone Dr., Mentor, OH 44060. ASD. Toll Free Tel: (800) 543-4764. Tel: (440) 285-7000. Fax: (440) 285-7005. Email: info@acousa.com. Web: http://www.acousa.com.
2. ACO, Inc.; 825 W Beechcraft St. P. O. Box 12067, Casa Grande, AZ 85122. Tel: (520) 421-9988. Fax: (520) 421-9899. Email: info@acousa.com. Web: http://www.acousa.com.

B. Substitutions: Not permitted.

2.2 SYSTEM DESIGN

A. Load Class: Provide trench drain system designed, engineered and installed to support the minimum loads as defined by EN1433. Load Class shall be Load Class A.

B. Grate Design: Safety.

1. Grates that comply with requirements of the Americans with Disabilities Act (ADA) of 1990 are available.
2. Other safety-focused grates include a 'heelsafe' pattern in compliance with American Society of Mechanical Engineers (ASME) A112.6.3, Floor and Trench Drains. Section 7.12, "Heel Resistant Strainers and Grates.
3. Grates are designed to prevent small stiletto-style heels from getting stuck, causing injury or falls. In addition, bicycle-safe grates avoid slot openings that can trap modern bicycle wheels.

C. Hydraulic Performance:

1. Trench drain system shall provide drain performance without grate bypass occurring and without uncontrolled ponding during maximum design flow rate and duration.

2.3 Sport System – Sports Arena Drainage

A. Product: System 2000 as manufactured by ACO, Inc.

1. System 2000 – Slotted track drain system.

a. Used at high profile venues, including professional and IAAF stadiums.
b. Track material can be applied to system top for a totally discrete solution.
c. Supplied in straight and radius channels.
d. In-line catch basin.
e. Optional TPE cellular rubber edge for athlete's safety.
f. Deep depth provides maximum hydraulic performance.
g. System provides a continuous run around the entire running track.

2. System 2000 Channels

a. Available in one meter (39.37") and half (19.69") lengths.
b. Invert of 8.8" (224mm)
c. One meter (39.37") available with radius for 'D' area of track

3. System 2000 Catch Basin

a. In-line catch basin.
b. Removable polymer concrete cover for easy access.
c. Plastic trash bucket acts as a sieve to collect debris.
d. Drill outs for 4" and 6" pipe connections.

B. Product: System 4000 as manufactured by ACO, Inc.

1. System 4000 – Straight drainage system with grates.

a. Common uses:

1) Running tracks
2) Team facilities
3) Tennis courts
4) Other recreational areas

b. Multiple channels
c. Multiple grates
d. In-line catch basin
e. Optional TPE cellular rubber edge for athlete's safety
f. System provides complete drainage for multiple recreational uses

2. System 4000 Channels

a. Available in one meter (39.37") and in half meter (19.69") lengths.
b. Meter (39.37") long channels are either neutral or sloped.
c. Half meter (19.69") channels are all neutral channels.
d. Sloped channels provide a continuous slope of 100 feet (30m) long.
e. Neutrals can extend the run.
f. 4" (100mm) internal width

3. System 4000 Catch Basin

a. In-line Catch Basin 4" Internal width
b. Plastic trash bucket acts as a sieve to collect debris.
c. 4" and 6" drill outs for pipe connections.

4. System 4000 Grates

a. Gray ADA Plastic – 19.69" (500mm)

2.4 MATERIALS

A. Polymer Concrete: Durable material which is resistant to road salts and common chemicals, made from polyester resin reinforced with mineral aggregates and fillers.

B. Galvanized steel: Commercial steel, ASTM A653/A653M.

C. Stainless Steel: Type 304, ASTM A240/A240M

D. Polyethylene

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces

B. Prepare surfaces using methods recommended by the manufacturer for achieving the best results for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer’s instructions and approved submittals. Install in proper relationship with adjacent construction.

3.4 PROTECTION

A. Protect Installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion

END OF SECTION 334000

SECTION 334200 - STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. PVC pipe and fittings.
2. Concrete pipe and fittings.
3. Nonpressure transition couplings.
4. Encasement for piping.
5. Manholes.
6. Catch basins.
7. Stormwater inlets.
8. Stormwater detention structures.
9. Pipe outlets.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins. Include plans, elevations, sections, details, frames, covers, and grates.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Piping materials are to bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C76.

1. Bell-and-spigot ends and gasketed joints with ASTM C443, rubber gaskets
2. Class IV, Wall A.

2.2 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be

joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C443, rubber.
2. For Cast-Iron Soil Pipes: ASTM C564, rubber.
3. For Fiberglass Pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.
4. For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.
5. For Dissimilar Pipes: ASTM D5926, PVC or other material compatible with pipe materials being joined.

2.3 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Material: ASTM A536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.4 CONCRETE

A. General: Cast-in-place concrete in accordance with ACI 318, ACI 350, and the following:

1. Cement: ASTM C150/C150M, Type II.

2. Fine Aggregate: ASTM C33/C33M, sand.
3. Coarse Aggregate: ASTM C33/C33M, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

   a. Invert Slope: 2 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

   a. Slope: 8 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

2.5 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C990, bitumen or butyl rubber.
6. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
7. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
8. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

B. Round Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include 24-inch ID by 7- to 9-inch riser with 4-inch- minimum width flange, and 26-inch- diameter flat grate with small square or

short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 INSTALLATION OF PIPING

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow, nonpressure drainage piping in accordance with the following:

1. Install piping pitched down in direction of flow.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with **42** minimum cover.
4. Install PVC sewer piping in accordance with ASTM D2321 and ASTM F1668.
5. Install reinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping in accordance with the following:

1. Join PVC corrugated sewer piping in accordance with ASTM D2321 for elastomeric-seal joints.
2. Join nonreinforced-concrete sewer piping in accordance with ASTM C14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
3. Join reinforced-concrete sewer piping in accordance with ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
4. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 INSTALLATION OF MANHOLES

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants in accordance with ASTM C891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.5 INSTALLATION OF CATCH BASINS

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.6 CONCRETE PLACEMENT

A. Place cast-in-place concrete in accordance with ACI 318.

3.7 CONNECTIONS

A. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.8 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.9 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:
    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems in accordance with requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test in accordance with requirements of authorities having jurisdiction, UNI-B-6, and the following:
    a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    b. Option: Test plastic piping in accordance with ASTM F1417.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 334200

Appendix 1
Additional Forms

C2AE

Houseman Field Replacement and
Briggs Field Replacement
Grand Rapids Public Schools
Kent County, Michigan

REQUEST FOR SUBSTITUTION

TO: _____ **DATE:** _____

PROJECT: Houseman Field Replacement and Briggs Field Replacement

SECTION	**PARAGRAPH**	**SPECIFIED ITEM**

PROPOSED SUBSTITUTION: _____ **MODEL:** _____

MANUFACTURER: _____ **PHONE:** (____) _____

Include product description, specifications, drawings, photographs, performance and test data adequate for evaluation. Clearly identify applicable portions of the data. Also include description of changes to contract documents that would be required as a result of the substitution.

The undersigned states that the following line items, unless modified on attachments, are correct:

A. I have read and fully understand the conditions for substitutions outlined in this specification section.

B. The proposed substitution does not affect dimensions shown on drawings.

C. The undersigned will reimburse architect for any building design changes required due to the substitution, including engineering, detailing, and services associated with re-approval by authorities.

D. I will coordinate installation and make both known and unforeseen changes to other work required for substitution at no additional cost to the owner.

E. The proposed substitution will have no adverse effect on other trades, the construction schedule, or specified warranty requirements.

F. Maintenance and service parts will be locally available for the proposed substitution.

G. The undersigned further states that the function, appearance, and quality of the proposed substitutions are equivalent or superior to the specified item.

SUBMITTED BY: _____

SIGNATURE _____

FIRM _____

ADDRESS _____

_____

TELEPHONE (____) _____

FAX (____) _____

FOR USE BY C2AE

ACCEPTED **ACCEPTED AS NOTED**

NOT ACCEPTED **RECEIVED TOO LATE**

BY _____

DATE _____

REMARKS _____

Document Request Procedure

Owners, Contractors or other Consultants may from time-to-time request electronic files from C2AE as records, backgrounds, use in shop drawing preparation or preparation of a new project.

In support of these requests, follow these steps:

1. Requesting party fills out this form, including name, contact and requested files, as well as the purpose for the request.
2. Submit form to C2AE (info@c2ae.com) or the C2AE project manager.
3. C2AE project manager will determine that the requested files are suitable for release and develop a cost of delivering the requested files and return form to Requesting Party for signature.
4. Requesting party will return signed form and payment for cost of delivery.
5. C2AE will return signed form with files.
6. An AIA E203 Building Information Modelling and Digital Data Exhibit may be used as an alternative to the form below.

Electronic Media Release, Disclaimer and Release of Claims

1. The parties to this agreement, Capital Consultants, Inc., dba "C2AE" in Michigan and dba "Capital Consultants Architecture and Engineering" in New York, hereinafter called the A|E CONSULTANT and OWNER / CONTRACTOR, hereinafter called the REQUESTOR, hereby agree that the A|E CONSULTANT will release Documents, as herein defined via electronic media, to the REQUESTOR. The parties hereto agree to the following:
2. In addition to other rights of ownership or use which may be granted to the REQUESTOR under this Agreement, the REQUESTOR shall be permitted to retain electronic or machine readable copies of the A|E CONSULTANT's Drawings, Specifications and other documents (collectively referred to as the Documents), and shall be permitted to use electronic or machine readable copies of the Documents for information and reference.
3. Under no circumstances shall the transfer of possession or ownership of physical copies of the Documents or of the physical media upon which electronic or machine readable copies of the Documents exist be deemed to be a sale by the A|E CONSULTANT of the Documents or of the information and data contained therein. The A|E CONSULTANT makes no representations or warranties, either express or implied, of merchantability, of fitness for a particular purpose, or with respect to the Documents quality, adequacy, completeness, or sufficiency, or with respect to any results to be or intended to be achieved with respect to their use. In no event shall we be liable for any loss of profit or any consequential damages as a result of your use or reuse of these electronic files.
4. The REQUESTOR acknowledges that the information and data delivered to the REQUESTOR in electronic or machine readable copies of the Documents may vary from that contained on physical copies of the Documents released for the purposes of bidding, construction or record drawings. Variances may be due to the use of different software, hardware, or output devices by the REQUESTOR or others from those used by the ENGINEER/ARCHITECT in originally preparing and printing the Documents. Variances may

also be the result of the manner in which software used to convert the Documents from the system or format employed by the A|E CONSULTANT to that of the REQUESTOR or others translates the information and data contained on the Documents. Variances may also be the result of undocumented changes or modifications made to the electronic or machine readable Documents, whether inadvertently or otherwise, and whether made by the REQUESTOR or others. The A|E CONSULTANT, therefore, reserves the right to retain the electronic or machine readable media upon which the Documents were originally prepared, and to retain physical copies of the Documents delivered to the REQUESTOR in electronic or machine readable form, which physical copies shall govern in the event of any inconsistency or discrepancy between the two. Media and physical copies will be retained by the A|E CONSULTANT for a period not to exceed five (5) years from the date noted herein. We make no representation as to the compatibility of these files with your hardware or software beyond the specified release of the referenced software.

5. For use in construction, these electronic files are not construction documents or record documents. Differences may exist between these electronic files and corresponding hard-copy construction documents or record drawings. We make no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents prepared by us and the electronic files, the signed or sealed hard-copy construction documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm, and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project.
6. Data contained in these electronic files are part of our instruments of service and shall not be used by you or anyone else receiving these data through or from you for any purpose other than as stated in the request. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to us. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against us, our officers, directors, employees, agents, or subconsultants that may arise out of or in connections with your use of the electronic files.
7. Because information presented on the electronic files can be modified, unintentionally or otherwise, we reserve the right to remove all indicia of ownership and/or involvement from each electronic display.
8. When the list of sheets, drawing files, models or other media is requested, C2AE will develop a cost of delivery to cover preparation time, any modifications required to protect sensitive information and final delivery. The delivery cost must be paid before the files are delivered.
9. In consideration of the A|E CONSULTANT's willingness to deliver electronic or machine readable copies of the Documents for the REQUESTOR's use as described above, and of the risks to the A|E CONSULTANT of inconsistencies, discrepancies or undocumented changes or modifications to the Documents, the REQUESTOR agrees to assume all risks associated with the use and modification, by the REQUESTOR or others, of electronic or machine readable copies of the Documents and, to the fullest extent permitted by law, to release, hold harmless, and to indemnify the A|E CONSULTANT, and to defend the A|E CONSULTANT using counsel satisfactory to the A|E CONSULTANT, from and against all claims, liabilities, losses, damages, judgments, awards, and costs including, but not limited to, court costs and attorneys fees, arising from, related to, or in any manner in connection with the use or modification by the REQUESTOR or others of electronic or machine readable copies of the Documents.

_____

REQUESTOR Name and Firm

Reason for Request / Purpose/Usage of the requested files: _____

_____

_____

_____

Address _____

City, State, Zip _____

Phone _____

Email _____

C2AE

BY: _____

TITLE: _____

WITNESS: _____

REQUESTOR:

BY: _____

TITLE: _____

WITNESS: _____

DATE: _____

C2AE Job No. 24-0160 / 24-0162

List of Files Requested:

1. _____
2. _____

Current File Format (C2AE will report)

_____

_____

C2AE Cost of Delivery: $_____

REQUEST FOR INFORMATION

PROJECT: **Houseman Field Replacement and Briggs Field Replacement**

COMPANY: _____

NAME: _____

PHONE: _____

E-MAIL: _____

DATE: _____

QUESTION:
(Type or print in box or attach additional typed pages with this cover page.)

SEND TO: Beth Dillsworth, C2AE
E-Mail: bidding@c2ae.com

Appendix 2
Geotechnical Report

MATERIALS TESTING CONSULTANTS

GEOTECHNICAL REPORT

GRAND RAPIDS PUBLIC SCHOOLS – RENOVATION OF HOUSEMAN FIELD AND BRIGGS FIELD
GRAND RAPIDS, MICHIGAN

Prepared For:

C2AE
Grand Rapids, Michigan

Prepared By:

MATERIALS TESTING CONSULTANTS, INC.

September 2024
MTC Project No. 241543

September 3, 2024
Project No. 241543

C2AE
50 Louis Street NW, Suite 200
Grand Rapids, Michigan 49503

Attention: Bob Winks, P.E.

Reference: Report of Geotechnical Investigation
Grand Rapids Public Schools – Renovation of Houseman Field and Briggs Field
Grand Rapids, Michigan

Dear Mr. Winks:

We have completed a geotechnical investigation for the above-referenced project. The purpose of this investigation has been to identify the general subsurface soil conditions in the vicinity of the proposed construction, analyze the conditions relative to the planned construction and to provide recommendations for the design of pavements. This work has been performed as described in our proposal No. 18281R dated July 17, 2024.

Presented herein are descriptions of our understanding of the design considerations, the geotechnical investigation, encountered conditions and engineering recommendations. The Appendix contains the report limitations and boring log terminology, soil classification chart, boring logs, and core photo logs.

DESIGN CONSIDERATIONS

Available Information

We have been provided the following documents and information for use in this investigation:

- A plan set of Houseman Field including civil and landscape, structural, architectural, food service, plumbing, mechanical, and electrical drawings prepared by TowerPinkster dated March 12, 2009 (61 sheets).
- A CAD survey file for Houseman Field drawn by Moore & Bruggink dated November 19, 2008 detailing existing grades and utilities onsite.
- Telephone conversations and email correspondence with Mr. Bob Winks, P.E. of C2AE regarding soil boring locations, schedule and other project information.

Project Description

The proposed construction will be located in plan as shown on the attached Boring Location Plan, Figure Nos. 1 and 2, at the existing Houseman Field and Briggs Field associated with Grand Rapids Public Schools. Houseman Field is located at address 162 Houseman Avenue and Briggs Field is located to the south of Briggs Park at address 324 Knapp Street both in Grand Rapids, Michigan.

The proposed project will consist of various surficial repairs and improvements at both locations including new tracks at Houseman Field and Briggs field in addition to replacement and expansion of the northwest parking lot at Houseman field. Based on the Houseman Field survey file and GPS elevations obtained during the field investigation we understand the site elevations at Houseman Field will remain near els 714 to 716 in the track and field areas and els 705 to 707 in the existing HMA parking lot and proposed expansion. At Briggs Field, the surface elevations are expected to remain as observed via GPS observations ranging from els 655 to 658.

We should be informed of any changes between the actual design conditions and those described herein as this information may affect our recommendations.

INVESTIGATION METHODOLOGY

Field Investigation

One of our geologists met with Mr. Jake Belfer, P.E. of C2AE to assist in staking the approximate boring locations in the field. Boring elevations were approximated using a survey grade GPS unit. The elevations used in this report are given in feet and are based on NAVD88 datum. If more precise location and elevation data are desired, a registered professional land surveyor should be retained to locate the borings and determine their ground elevations.

Hand auger borings, pavement coring and hand sampling along with field engineering reconnaissance were performed to investigate the subsurface conditions. A total of fifteen (15) conventional soil test borings were completed. Borings B-1 to B-9 were completed at Houseman Field and Borings B-10 to B-15 were completed at Briggs Field. Boring depths ranged from 3.5 feet to 5 feet below the existing ground surface. Boring locations are shown on the attached plans, Figure Nos. 1 and 2. Historical boring logs completed by MTC at or near the site (MTC Project Nos. 051660 and 081449) were reviewed to supplement the field investigation.

A Pavement Surface Evaluation and Rating (PASER) assessment was conducted at the existing parking lot at Houseman Field to rate the current condition of the pavement and identify existing distresses.

At regular intervals within granular material, Dynamic Cone Penetrometer (DCP) testing was completed to approximate the relative density based on equivalent N-values (ASTM STP399). Within cohesive soils, estimates of the unconfined compressive strength were obtained using a calibrated pocket penetrometer. Pavement cores were taken back to our office and photo documented. The boreholes were backfilled to the original ground surface using soil cuttings and borings within the pavement areas were sealed at the ground surface using asphalt cold patch.

Borings were drilled and other sampling was conducted solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.

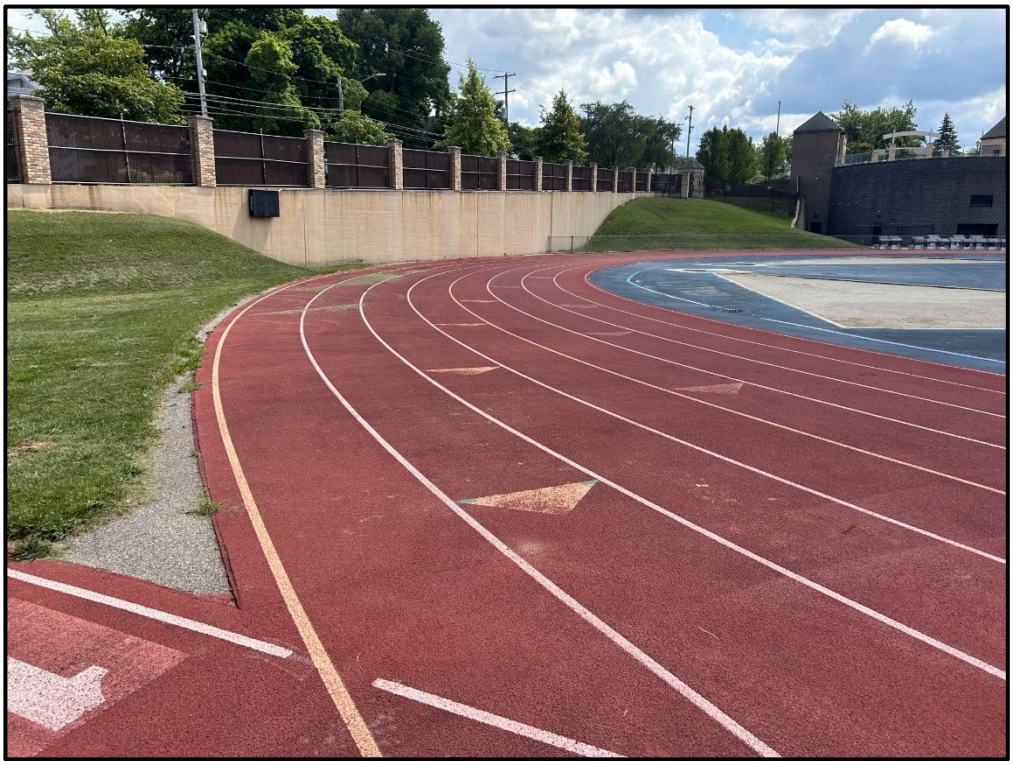
INVESTIGATION RESULTS

Existing Site Conditions

Houseman Field

The existing outdoor track surface was noted to be in generally good condition at the time of our field investigation with no obvious signs of ground distortion (settlement or heave). Minor cracking of the rubberized surface was noted in the northwest corner in running lanes 3 and 4. Minor spalling and other wear was noted in general on the surface of the rubberized surface likely due to age and general usage. Wear and staining were noted in the expanded track area to the east (blue areas) possibly due to surface water drainage issues (i.e. ponded water). Existing storm drainage was observed as catch basins along the inside perimeter of the track and the surface of the playing field. The existing artificial turf on the playing surface appeared to be in good condition.

Houseman Field, northwest corner, looking southeast



Houseman Field, northeast corner, looking southeast with retaining wall at Diamond Avenue

Houseman Field, pavement near the scoreboard behind the flagpole

Houseman Field Northwest Parking Lot

Based on our PASER assessment, we estimate a pavement rating of 5. Minor to moderate surface raveling of surface aggregate has begun to expose some aggregate underneath. No noticeable surface deformation (displacement of material) as rutting (wheel path channels) or other distortion as settling or uplift was observed. Block cracking was present and with spacing ranging from wide (over 50 feet) to close (within several feet). Cracks appeared to be tight (1/4 inch or less) to open (more than ½ inch). The closely spaced cracking appeared at the intersection of block cracking patterns and were observed by the east end near the handicapped parking stalls, under the basketball hoop, and near the manhole to the south of the lot. No evidence of overband crack sealing was observed on the existing cracks and in some cases grass and weeds were growing out of the cracks. No evidence of seal coating was observed at the time of our investigation. Existing HMA pavement outside of the rubberized track area appeared to be in a similar state of condition as the parking area to the northwest of the field. Drainage appeared to be facilitated through interior parking lot catch basins to interior catch basins with curbs and gutters surrounding the parking lot.

Houseman Field, northwest parking lot, looking north

Houseman Field, northwest parking lot, looking south

Briggs Field

The existing track surface was observed to be in poor to fair condition. No obvious signs of ground distortion as settlement or heave were observed. The rubberized surface has experienced wear as spalling which appeared severe compared to the track surface at Houseman Field. Areas were observed where the rubberized surface was completely missing. Where the rubberized track surface was missing the exposed HMA pavement showed signs of distress as closely spaced block cracking. Cracks in the exposed HMA surface likely propagate in areas underneath the rubberized surface. Block cracking within the underlying asphalt may have been attributed to surface rubberized track distress observed due to either reflective cracking or loss of bond. Grass and weeds were observed growing out of the cracks in the track surface. The rubberized track surface was especially worn in the southwest corner near the single-story building.

Briggs Field, track surface near the southwest corner, looking east

Briggs Field, track surface near southwest corner, looking northwest

Briggs Field, playing surface near the east endzone, looking west

Subsurface Conditions

The investigation, in general, in pavement areas, encountered 2 1/2 to 3 1/2 inches of HMA overlying 6 to 12 inches of gravel base. Sand subbase beneath the gravel base extended 24 inches or greater in the pavement areas, extending to the end of the explored depths of 5 feet below the ground surface. Granular material exhibited loose to medium dense relative densities with equivalent N-values ranging from 5 to 18. An exception, Boring B-1, did not have sand subbase beneath the gravel base. Very stiff lean clay was encountered immediately below the gravel base at Boring B-1, corresponding to a calibrated pocket penetrometer reading of 2.5 tsf.

Borings completed in the grassy areas, in general, encountered 5 to 9 inches of topsoil overlying loose to medium dense granular material with equivalent N-values ranging from 6 to 17 to the end of the explored depths of 3.5 to 5 feet below the ground surface. An exception, Boring B-7, encountered stiff lean clay from 3.5 to 4.3 feet below the ground surface, with a calibrated pocket penetrometer reading of 1.5 tsf. Beneath the clay, a clayey sand was encountered to the end of the explored depths of 5 feet below existing grades.

All borings noted fill until the end of the explored depths of 3.5 to 5 feet below the ground surface. The relative density of granular soil is based on recorded DCP equivalent N-values while the consistency of cohesive soil is based on estimates of the unconfined compressive strength obtained with a calibrated penetrometer.

Houseman Field

The borings were completed in grassy areas or pavement areas adjacent to existing track and field surface structures. Borings B-1, B-3, B-6, B-8, and B-9 encountered 2 1/2 to 3 1/2 inches of HMA overlying 6 to 12 inches of HMA with loose to medium dense granular subbase encountered to the end of the explored depths (DCP equivalent N-values ranged from 5 to 18). The table below summarizes the pavement section encountered.

Boring	Pavement Section (inches)			Location
	HMA	Gravel Base	Sand Subbase	
B-1	3 ½	12	0	NW Parking Lot
B-3	3 ½	6	24+	NW Parking Lot
B-6	3 ¼	7	24+	Track
B-8	3	9	24+	Track
B-9	2 ½	8	24+	Track

Borings B-2, B-4, B-5 and B-7 encountered 7 to 8 inches of topsoil overlying medium dense granular subgrade corresponding to DCP equivalent N-Values of 12 to 17.

Groundwater was not encountered in Borings B-1 through B-8; however, groundwater was encountered at Boring B-9 at a depth of approximately 2 ft.

Briggs Field

Borings B-10 to B-15 were completed at Briggs Field and generally encountered 5 to 9 inches of topsoil overlying loose to medium dense granular subgrade to the end of the explored depths of 3.5 to 5 feet. DCP equivalent N-Values ranged from 6 to 16.

Groundwater was not encountered during the drilling activities at Borings B-10 through B-15.

Groundwater levels may fluctuate due to seasonal variations such as precipitation, snowmelt, nearby river or lake levels and other factors that may not be evident at the time of measurement. Groundwater levels may be different at the time of construction.

Historic borings completed in 2005 and 2008 at Houseman Field (MTC PN 051660 and 081449) generally encountered similar soil conditions as observed in this investigation.

This section has provided a generalized description of the encountered subsurface soil conditions. The boring logs located in the Appendix should be reviewed for detailed soil descriptions. Some variation between boring locations may be expected.

CONCLUSIONS AND RECOMMENDATIONS

A summary of recommended pavement rehabilitation options for the existing parking lot at Houseman Field in addition to recommendations for new pavement and general site an subgrade preparation are provided in this section. The Designer and Contractor performing the rehabilitation should review, understand, and implement the recommendations contained herein. We understand that the Designer of the track will be responsible for recommendations regarding a track section based on the soil encountered in this exploratory investigation.

Houseman Field Parking Lot

The pavement was observed to be in fair condition and rated as a 5 on the PASER scale. No sand subbase was encountered in Boring B-1 and this area should be considered for full depth reconstruction. However, based on past performance and age, similar performance would likely be realized if the subbase is not replaced, and proper drainage addressed with an underdrain system. Due to the expansion of the existing HMA parking area, it would be beneficial to reconstruct this lot full depth (especially considering the clay in contact with the gravel base encountered in B-1) as this would align the age and performance with any new proposed expanded parking areas.

Considering the limited degree of age-related distresses observed and the existing pavement section encountered in the borings, we recommend one of the following rehabilitation options be considered for the existing HMA pavement depending on the Owner's preference on pavement design life and risk:

- A full-depth mill and replacement of the existing HMA; or
- Full-depth reconstruction of the existing pavement section

The full-depth mill and replacement option would be the most cost-effective rehabilitation approach, likely extending the life of the existing pavement by 10 years but would present greater risk to potential long-term performance issues. The full-depth mill and replacement option would provide a shorter life expectancy before future pavement rehabilitation would be required and is likely to experience similar distresses as currently being observed over time considering the existing gravel and subgrade remain unchanged.

The full-depth reconstruction option would be more expensive but would provide a longer life expectancy of the pavement likely on the order of 15 to 20 years considering routine maintenance is performed. In general, preventing water accumulation in the sand subbase will be critical to achieving a long life for the HMA pavement.

The new asphalt pavement section should be constructed in accordance with the MDOT 2020 Standard Specifications for Construction and all applicable Special Provisions. We have provided pavement section recommendations considering traffic consisting of relatively light passenger vehicles with only occasional heavier axle wheel loading from buses and trucks for refuse pickup.

Granular material used for sand subbase or areas where subgrade undercuts are identified as being needed during subgrade preparation efforts should meet the requirements of MDOT Class II fill and be compacted to at least 95 percent of the soil's maximum dry density as determined by the Modified Proctor test (ASTM D1557). Aggregate base should meet the requirements of MDOT 21AA and be compacted to at least 95 percent of the soil's maximum dry density as determined by the Modified Proctor test (ASTM D1557).

Full-Depth Mill and Replacement Option

Following aggregate preparation as described in the "Site and Subgrade Preparation" section below, the new HMA pavement should be constructed.

The following flexible pavement section is recommended:

Flexible Pavement Section

Traffic Condition	Standard Duty	Heavy Duty
Bituminous leveling course thickness, inches	2.0	2.5
Bituminous wearing course thickness, inches	1.5	2.0

The following materials are recommended:

Flexible Pavement Materials

Traffic Condition	Standard Duty
Bituminous leveling	MDOT 13A or 4EML
Bituminous wearing	MDOT 36A or 5EML

The binder grade should be a minimum PG 58-28. MDOT standard specifications for materials and placement should be observed.

Full-Depth Reconstruction Option and Parking Lot Expansion

Following subgrade preparation as described in the "Site and Subgrade Preparation" section below, the new pavement section should be constructed.

The following flexible pavement sections are recommended:

Flexible Pavement Section

Traffic Condition	Standard Duty	Heavy Duty
Sand subbase thickness, inches	10	12
Aggregate base thickness, inches	6	8
Bituminous leveling course thickness, inches	2.0	2.5
Bituminous wearing course thickness, inches	1.5	2.0

The following materials are recommended:

Flexible Pavement Materials

Traffic Condition	Standard Duty	Heavy Duty
Sand subbase	MDOT Class II granular	
Aggregate base	MDOT 21AA Natural Aggregate	
Bituminous leveling	MDOT 13A or 4EML	
Bituminous wearing	MDOT 36A or 5EML	MDOT 13A or 4EML

Sand subbase material should be laboratory tested to confirm MDOT Class II grading requirement. MDOT standard specifications for materials and placement should be observed. We recommend a maximum of 17 percent recycled asphalt pavement (RAP), measured as a percent of asphalt replacement, be utilized in HMA mixes. Air voids should be field regressed to 3.5 percent using liquid asphalt cement.

A natural aggregate base product, often consisting of crushed limestone, is recommended relative to crushed concrete aggregate base products considering the long-term performance risk crushed concrete presents due to potential hydration of free cement and decreased permeability over time.

Construction procedures and workmanship are of key importance with respect to pavement appearance and long-term pavement performance. Key components of workmanship include appropriate joint construction resulting in sufficient density, prevention of segregation, and maintaining a minimum temperature during placement. At a minimum, the procedures outlined in Section 501 of the 2020 MDOT Specifications should be followed with respect to equipment, placement, and temperatures. Compaction of the asphalt courses should range between 92 and 96 percent of the Theoretical Maximum Density (TMD) based on MDOT requirements.

It is recommended that cracks that may develop in the pavement be quickly and properly sealed through a regular maintenance program. Also, the subgrade should be sufficiently sloped to provide drainage within the sand subbase and underdrains should be provided within the subbase, at catch basins and pavement edges, to facilitate drainage. At each catch basin, four underdrains with a watertight connection should extend out radially at least 20 ft. A suitable rubberized asphalt sealant should be placed between all concrete curb/HMA joints immediately after paving.

Joint Construction

Industry best practices for longitudinal joint construction should be followed to optimize long-term joint performance. Premature joint failures are the result of a combination of low asphalt density, asphalt mix segregation, high permeability, and a lack of tensile strength at the joint interface. We recommend the use of either the butt joint or notched wedge joint method of longitudinal joint construction. When two pavement lanes will meet at a longitudinal joint, the

hot lane should overlap the area of the cold lane by 1 inch +/- 0.5 inches. A vibratory roller should be used to evenly compact each pavement lane being constructed. Unsupported joint faces should be compacted with the vibratory roller drum extended out 6 inches over the edge of the asphalt mat. Once the adjacent pavement lane has been placed, the first pass of the vibratory roller on the new lane (hot mat) should stay a minimum 6 to 8 inches from the joint, and the second pass should overlap onto the first pavement lane (cold mat) 4 to 6 inches. The hot mat should be at least 1/8 inch higher than the cold mat to prevent bridging (roller being supported by the cold mat). Automated paving equipment is recommended to ensure a sufficient depth of asphalt material along construction joints. The relative density of both unsupported joint faces and supported joints should be monitored in the field using a density gauge.

Site and Subgrade Preparation

If the full-depth mill and replacement option is selected, full-depth roto-milling of the existing HMA should be performed until the gravel base is exposed. Prior to placing new HMA, the exposed gravel base should be compacted and any soft or yielding areas undercut a minimum 12 inches and backfilled in lifts with MDOT 21AA dense-graded aggregate. Aggregate should be placed in lifts no greater than 6 inches thick when compacted. Should the surface of the gravel continue to perform poorly under proof roll, additional undercutting may be required and/or the use of a geotextile fabric or geogrid.

If the full-depth reconstruction option is selected, full-depth roto-milling of the existing HMA should be performed until the gravel base is exposed. The gravel base should then be removed from the area with material meeting MDOT 21AA gradation stockpiled nearby for later use. The granular subgrade soil should then be excavated to 19.5 inches below the finish HMA elevation. The exposed subgrade should be proof-rolled and any soft or yielding areas over-excavated a minimum 12 inches and backfilled in lifts with engineered fill meeting the requirements of MDOT Class II fill. Following subgrade proof-roll or overexcavation and replacement, the new pavement section should be constructed.

For new HMA pavement areas, the limits of the proposed construction area, should be cut to the bottom of the pavement section elevation and the exposed subgrade should be proof-rolled and any soft or yielding areas over-excavated a minimum 12 inches and backfilled in lifts with engineered fill meeting the requirements of MDOT Class II fill. Following subgrade proof-roll or overexcavation and replacement, the new pavement section should be constructed.

Proofrolling is defined as the passing of relatively heavy construction equipment over the soil subgrade under observation by the Geotechnical Engineer. The response of the soil, when subjected to the applied load, is subjectively evaluated by qualified geotechnical personnel with respect to its ability to support the overlying soil or structure. In areas where excessive deflection is observed, special subgrade preparation measures may be recommended to provide an acceptable subgrade condition. These measures may consist of compaction of the

subgrade at moisture contents close to the optimum value, undercutting affected areas and replacing with engineered fill, use of a geotextile separation fabric or some combination of these measures.

Engineered fill is approved on-site or imported soil placed in uniform layers and compacted to a minimum required density. Imported engineered fill should meet the requirements for MDOT Class II granular material.

Granular engineered fill and backfill should be compacted to at least 95 percent of the soil's maximum dry density as determined by the Modified Proctor test (ASTM D1557). Vibratory compaction methods are typically found to be most effective in granular soils; however, relatively light equipment should be used adjacent to walls to avoid overstressing the walls.

The fill should be placed and compacted in horizontal layers not exceeding 9 inches. Field density tests should be taken on each lift, as the fill is being placed, to verify compliance with compaction specifications.

If the earthwork takes place during winter months, fill must not be placed on frozen ground and fill with frozen conglomerations of soil must not be used.

Because the site has been previously developed, there may be buried items not encountered in our borings, such as a septic tank, well, or utility conduit, which may cause settlement problems. The contract documents should reflect that it is necessary to remove or relocate such structures and to fill the excavation with engineered fill.

CLOSURE

In this report, descriptions of the geotechnical investigation, encountered conditions, and recommendations for the design of pavement and site preparation have been provided. The limitations of this study are described in the Appendix.

The recommendations presented in this report are based upon a limited number of subsurface samples obtained from various sampling locations. The samples may not fully indicate the nature and extent of the variations that actually exist between sampling locations. For that reason, among others, we strongly recommend that a qualified geotechnical firm be retained to observe earthwork construction. If variations or other latent conditions become evident during construction, it will be necessary for us to review these conditions and our recommendations as appropriate.

We appreciate this opportunity to provide geotechnical engineering services and express our interest in providing continuing services in the areas of subgrade verification, special inspections and quality assurance testing on various construction materials. Please contact our office should you have any questions or require further assistance.

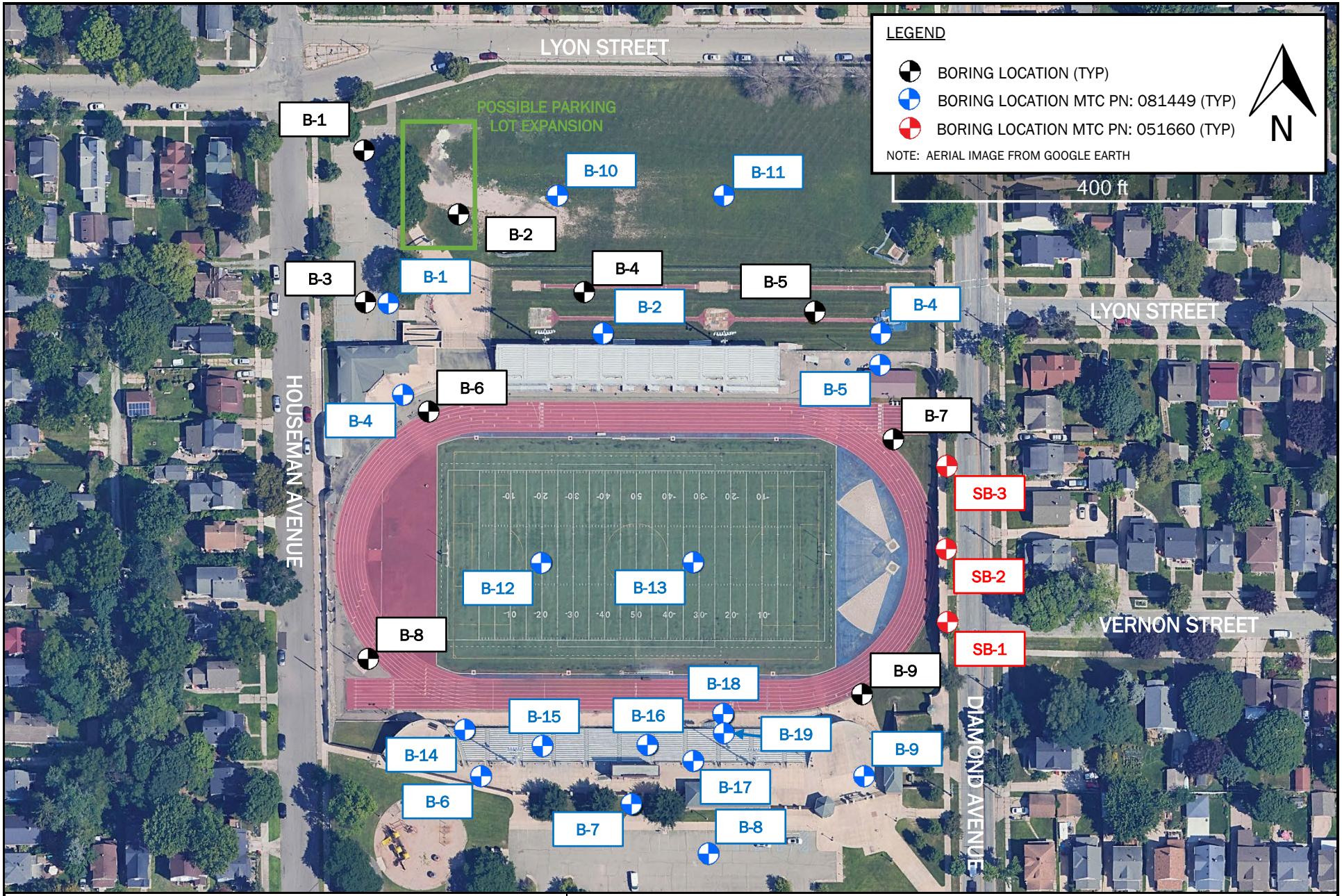
Sincerely,

MATERIALS TESTING CONSULTANTS, INC.

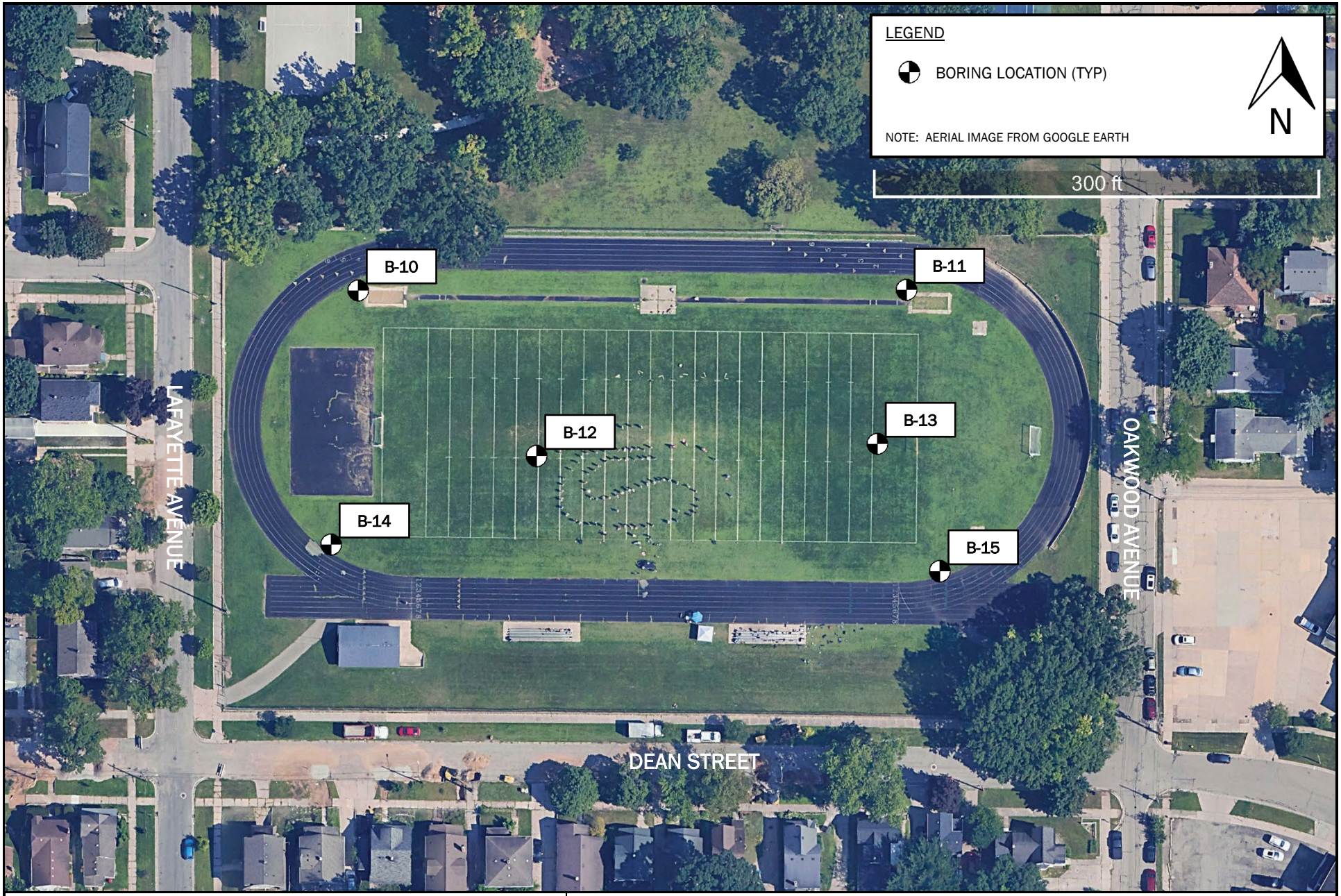
Mark A. DeHoog, E.I.T.
Senior Staff Engineer

Jacob M. Siegrist, P.E.
Project Manager

Attachments: Figure Nos. 1 & 2 - Boring Location Plan
Appendix
- Limitations
- Test Drilling and Sampling Procedures
- Boring Log Terminology and Classification Outline
- Boring Logs
- Historical Boring Logs



TITLE: BORING LOCATION PLAN – HOUSEMAN FIELD		PROJECT: GRAND RAPIDS PUBLIC SCHOOLS – RENOVATION OF HOUSEMAN FIELD & BRIGGS FIELD	
SCALE: AS SHOWN	DATE: 8/16/2024	PROJECT NO.: 241543	MTC MATERIALS TESTING CONSULTANTS
FIG. NO.: 1	DR. BY: MD	REV. BY: JS	



TITLE: BORING LOCATION PLAN – BRIGGS FIELD		PROJECT: GRAND RAPIDS PUBLIC SCHOOLS – RENOVATION OF HOUSEMAN FIELD & BRIGGS FIELD	
SCALE: AS SHOWN	DATE: 8/16/2024	PROJECT NO.: 241543	MTC MATERIALS TESTING CONSULTANTS
FIG. NO.: 2	DR. BY: MD	REV. BY: JS	

APPENDIX

- Limitations
- Test Drilling and Sampling Procedures
- Boring Log Terminology and Classification Outline
- Boring Logs
- Historical Boring Logs

LIMITATIONS

Soil Variations

The recommendations in this report are based upon the data obtained from the soil borings. This report does not reflect variations which may occur between these borings, and which would not become evident until construction. If variations then become evident, it would be necessary for a re-evaluation of recommendations of this report, after performing on-site observations.

Warranties

We have prepared this report in accordance with generally accepted soil and foundation engineering practices. We make no other warranties, either expressed or implied, as to the professional advice provided under the terms of our agreement and included in this report. This report is prepared exclusively for our client and may not be relied upon by other parties without written consent from our office.

Boring Logs

In the process of obtaining and testing samples and preparing this report, we follow reasonable and accepted practice in the field of soil engineering. Field logs maintained during drilling describe field occurrences, sampling locations, and other information. The samples obtained in the field are subjected to additional testing in the laboratory and differences may exist between the field logs and the final logs. The engineer reviews the field logs and laboratory test data, and then prepares the final boring logs. Our recommendations are based on the contents of the final logs.

Review of Design Plans and Specifications

In the event that any changes in the design of the building or the location, however slight, are planned, our recommendations shall not be considered valid unless modified or approved in writing by our office. We recommend that we be provided the opportunity to review the final design and specifications in order to determine whether changes in the original concept may have affected the validity of our recommendations, and whether our recommendations have, in fact, been implemented in the design and specifications.

TEST DRILLING AND SAMPLING PROCEDURES

Test Drilling Methods:

_____ Hollow stem auger, ASTM D6151
_____ Mud rotary, ASTM D5783
_____ Casing advancer, ASTM D5872
_____ Rock coring, ASTM D2113
__X__ Core/Hand Auger & DCP, STP 399

Note: Cone penetration test data can be used to interpret subsurface stratigraphy and can provide data on engineering properties of soils. The ASTM procedure does not include a procedure for determining soil classification from CPT testing. Soil classifications shown on CPT logs are based on published procedures and are not based on physical ASTM soil classification tests.

Sampling Methods:

_____ SPT, ASTM D1586, Auto hammer (140 lb., 30" drop, 2" OD split spoon sampler)
_____ Thin-walled tube sampler (Shelby), ASTM D1587

Note: The number of hammer blows required to drive the SPT sampler 12 inches, after seating 6 inches, is termed the soil N-value and provides an indication of the soil's relative density and strength parameters at the sample location. SPT blow counts in 6 inch increments are recorded on the boring logs.

Drill Rig:

_____ CME 55 (ATV)
_____ Acker Renegade (ATV)
_____ CME 45 Truck
_____ Geoprobe 7822 (ATV)
_____ Geoprobe Rotary Sonic

Boreholes Backfilled With:

__X__ Excavated soil
_____ Cement bentonite grout
_____ Piezometer or Monitoring Well (see notes on logs)
__X__ Concrete or asphalt patch where appropriate

Sample Handling and Disposition:

__X__ Samples labeled, placed in sample bags/jars, returned to MTC Laboratory
__X__ Discard after 60 days

LOG OF BORING

Project No.: 241543
Boring No.: B-1
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By:
Coordinates: N=537261.4 E=12780759.7 (MI South ift)
Elevation: 705.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 5.0 ft.

Date Begin: 08/12/2024 Date End: 08/12/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
705.2	0.25					3 1/2" HMA (0.3)				Fill: 0' to 5'
704.9	0.50					12" Gravel Base (1.1)				
704.7	0.75									
704.4	1.00									
704.2	1.25									
703.9	1.50				CL	Brown lean CLAY; mostly clayey fines, few sandy fines, moist, Fill (2.5)	2.5			
703.7	1.75	A-1								
703.4	2.00									
703.2	2.25									
702.9	2.50									
702.7	2.75				SP	Brown poorly graded SAND; mostly fine sand, trace silty fines, moist, Fill (5.0)				
702.4	3.00	A-2		13						
702.2	3.25									
701.9	3.50									
701.7	3.75									
701.4	4.00									
701.2	4.25									
700.9	4.50									
700.7	4.75			15						
700.4	5.00									
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-2
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=537200.7 E=12780843.8 (MI South ift)
Elevation: 706.5 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings. Cave in at 5.0 ft.

Date Begin: 08/12/2024 Date End: 08/12/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
706.3	0.25					8" Topsoil				Fill: 0' to 5'
706.0	0.50					0.7				
705.8	0.75					Brown poorly graded SAND; mostly fine sand, few clayey fines, moist, Fill				
705.5	1.00									
705.3	1.25	A-1		14						
705.0	1.50									
704.8	1.75									
704.5	2.00									
704.3	2.25									
704.0	2.50			15						
703.8	2.75									
703.5	3.00				SP					
703.3	3.25					Grades with asphalt fragments at 3'				
703.0	3.50									
702.8	3.75					Grades light brown at 3.5'				
702.5	4.00	A-2		12						
702.3	4.25									
702.0	4.50									
701.8	4.75									
701.5	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-3
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=537115.9 E=12780755.7 (MI South ift)
Elevation: 705.9 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 5.0 ft.

Date Begin: 08/12/2024 Date End: 08/12/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
705.7	0.25					3 1/2" HMA 0.3				Fill: 0' to 5'
705.4	0.50					6" Gravel Base 0.8				
705.2	0.75									
704.9	1.00					Brown poorly graded SAND; mostly fine sand, trace clayey fines, moist, Fill				
704.7	1.25			8						
704.4	1.50									
704.2	1.75	A-1								
703.9	2.00									
703.7	2.25			9						
703.4	2.50									
703.2	2.75									
702.9	3.00				SP					
702.7	3.25					Grades with clayey lenses at 3'				
702.4	3.50									
702.2	3.75									
701.9	4.00	A-2		11						
701.7	4.25									
701.4	4.50									
701.2	4.75									
700.9	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-4
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=537123.0 E=12780964.1 (MI South ift)
Elevation: 708.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings. Cave in at 5.0 ft.

Date Begin: 08/12/2024 Date End: 08/12/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
708.2	0.25					7" Topsoil				Fill: 0' to 5'
707.9	0.50					0.6				
707.7	0.75									
707.4	1.00			15		Brown poorly graded SAND with silt; mostly fine sand, few silty fines, moist, Fill				
707.2	1.25	A-1								
706.9	1.50									
706.7	1.75				SP-SM					
706.4	2.00									
706.2	2.25									
705.9	2.50									
705.7	2.75									
705.4	3.00					3.0				
705.2	3.25					Brown poorly graded SAND; mostly medium to fine sand, trace silty fines, moist, Fill				
704.9	3.50	A-2								
704.7	3.75									
704.4	4.00				SP					
704.2	4.25									
703.9	4.50									
703.7	4.75									
703.4	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-5
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=537097.9 E=12781183.3 (MI South ift)
Elevation: 708.6 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings. Cave in at 5.0 ft.

Date Begin: 08/12/2024 Date End: 08/12/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
708.4	0.25					8" Topsoil				Fill: 0' to 5'
708.1	0.50									
707.9	0.75					0.7				
707.6	1.00					Brown poorly graded SAND with silt; mostly fine sand, few silty fines, moist, Fill				
707.4	1.25	A-1		13						
707.1	1.50									
706.9	1.75				SP-SM					
706.6	2.00									
706.4	2.25									
706.1	2.50									
705.9	2.75					2.8				
705.6	3.00					Brown poorly graded SAND; mostly fine sand, trace silty fines, moist, Fill				
705.4	3.25	A-2		14						
705.1	3.50				SP					
704.9	3.75					3.8				
704.6	4.00					Brown clayey SAND; mostly medium to fine sand, little clayey fines, moist, Fill				
704.4	4.25	A-3		15						
704.1	4.50				SC					
703.9	4.75									
703.6	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-6
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=537010.9 E=12780816.1 (MI South ift)
Elevation: 714.3 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 5.0 ft.

Date Begin: 08/12/2024 Date End: 08/12/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
714.1	0.25					3 1/4" HMA				Fill: 0' to 5'
713.8	0.50					0.3				
713.6	0.75					7" Gravel Base				
713.3	1.00					0.9				
713.1	1.25					Brown poorly graded SAND; mostly medium to fine sand, trace silty fines, moist, Fill				
712.8	1.50									
712.6	1.75	A-1		18						
712.3	2.00									
712.1	2.25									
711.8	2.50			14						
711.6	2.75									
711.3	3.00				SP					
711.1	3.25					Grades with clayey lenses at 3'				
710.8	3.50									
710.6	3.75			5						
710.3	4.00									
710.1	4.25									
709.8	4.50									
709.6	4.75									
709.3	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-7
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=536980.3 E=12781255.5 (MI South ift)
Elevation: 714.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings. Cave in at 5.0 ft.

Date Begin: 08/12/2024 Date End: 08/12/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
714.2	0.25					8" Topsoil				Fill: 0' to 5'
713.9	0.50									
713.7	0.75					0.7				
713.4	1.00					Brown poorly graded SAND; mostly fine sand, trace silty fines, moist, Fill				
713.2	1.25	A-1		17		Trace roots at 1'				
712.9	1.50									
712.7	1.75									
712.4	2.00									
712.2	2.25	A-2			SP	Grades without roots at 2'				
711.9	2.50									
711.7	2.75									
711.4	3.00									
711.2	3.25			15						
710.9	3.50					3.5				
710.7	3.75	A-3				Brown lean CLAY; mostly clayey fines, trace fine gravel, moist, Fill	1.5			
710.4	4.00				CL					
710.2	4.25					4.3				
709.9	4.50					Brown clayey SAND; mostly fine sand, little clayey fines, moist, Fill				
709.7	4.75	A-4			SC					
709.4	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-8
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=536779.3 E=12780755.5 (MI South ift)
Elevation: 714.3 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 5.0 ft.

Date Begin: 08/12/2024 Date End: 08/12/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
714.1	0.25					3" HMA 0.3				Fill: 0' to 5'
713.8	0.50					9" Gravel Base				
713.6	0.75									
713.3	1.00					1.0				
713.1	1.25					Brown poorly graded SAND; mostly fine sand, trace silty fines, moist, Fill				
712.8	1.50			15						
712.6	1.75									
712.3	2.00	A-1								
712.1	2.25									
711.8	2.50									
711.6	2.75			12						
711.3	3.00				SP	Grades light brown				
711.1	3.25									
710.8	3.50									
710.6	3.75									
710.3	4.00									
710.1	4.25			15						
709.8	4.50									
709.6	4.75									
709.3	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-9
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=536738.4 E=12781221.9 (MI South ift)
Elevation: 714.3 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 3.0 ft.

Date Begin: 08/12/2024 Date End: 08/12/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	2±
Sampler	Hand Auger	3 1/4"	End	1.75±
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 3.5 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
714.1	0.25					2 1/2" HMA 0.2				Fill: 0' to 3.5'
713.8	0.50					8" Gravel Base				
713.6	0.75					0.9				
713.3	1.00					Brown poorly graded SAND; mostly coarse to medium sand, trace fine gravel, moist, Fill				
713.1	1.25									
712.8	1.50			14						
712.6	1.75									
712.3	2.00									
712.1	2.25				SP	Grades wet at 2'				
711.8	2.50									
711.6	2.75			11						
711.3	3.00									
711.1	3.25									
710.8	3.50					3.5				
						End of Boring				Auger refusal due to wet collapsing sand at 3.5'

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-10
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By:
Coordinates: N=548296.4 E=12776938.6 (MI South ift)
Elevation: 655.5 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings. Cave in at 5.0 ft.

Date Begin: 08/13/2024 Date End: 08/13/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
655.3	0.25					8" Topsoil				Fill: 0' to 5'
655.0	0.50									
654.8	0.75					0.7				
654.5	1.00					Brown poorly graded SAND: mostly fine sand, trace fine gravel, moist, Fill				
654.3	1.25			13						
654.0	1.50									
653.8	1.75	A-1								
653.5	2.00									
653.3	2.25			13						
653.0	2.50									
652.8	2.75									
652.5	3.00				SP					
652.3	3.25									
652.0	3.50									
651.8	3.75					Clayey lenses at 3.5'				
651.5	4.00									
651.3	4.25			16						
651.0	4.50									
650.8	4.75									
650.5	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-11
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=548292.9 E=12777308.4 (MI South ift)
Elevation: 655.6 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings. Cave in at 5.0 ft.

Date Begin: 08/13/2024 Date End: 08/13/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
655.4	0.25					5" Topsoil				Fill: 0' to 5'
655.1	0.50					0.4				
654.9	0.75			11		Brown poorly graded SAND; mostly fine sand, trace fine gravel, moist, Fill				
654.6	1.00									
654.4	1.25									
654.1	1.50									
653.9	1.75	A-1								
653.6	2.00			13						
653.4	2.25									
653.1	2.50									
652.9	2.75				SP					
652.6	3.00									
652.4	3.25					Grades light brown with no gravel at 3'				
652.1	3.50									
651.9	3.75			14						
651.6	4.00									
651.4	4.25									
651.1	4.50									
650.9	4.75									
650.6	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-12
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=548183.3 E=12777059.9 (MI South ift)
Elevation: 657.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings. Cave in at 5.0 ft.

Date Begin: 08/13/2024 Date End: 08/13/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
657.2	0.25					6" Topsoil				Fill: 0' to 5'
656.9	0.50					0.5				
656.7	0.75					Brown poorly graded SAND; mostly fine sand, few fine gravel, moist, Fill				
656.4	1.00			10						
656.2	1.25									
655.9	1.50									
655.7	1.75	A-1								
655.4	2.00									
655.2	2.25			13						
654.9	2.50									
654.7	2.75									
654.4	3.00				SP					
654.2	3.25					Coarse COBBLE at 3'				
653.9	3.50									
653.7	3.75									
653.4	4.00			14						
653.2	4.25									
652.9	4.50									
652.7	4.75									
652.4	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-13
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=548188.8 E=12777285.2 (MI South ift)
Elevation: 656.9 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings.

Date Begin: 08/13/2024 Date End: 08/13/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
656.7	0.25					7" Topsoil				Fill: 0' to 5'
656.4	0.50									
656.2	0.75					0.6				
655.9	1.00			12		Brown poorly graded SAND; mostly fine sand, few coarse gravel, moist, Fill				
655.7	1.25									
655.4	1.50	A-1								
655.2	1.75									
654.9	2.00									
654.7	2.25									
654.4	2.50									
654.2	2.75					COBBLE at 2.5'				
653.9	3.00				SP					
653.7	3.25			14						
653.4	3.50									
653.2	3.75									
652.9	4.00									
652.7	4.25									
652.4	4.50									
652.2	4.75			14						
651.9	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-14
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=548124.3 E=12776919.6 (MI South ift)
Elevation: 655.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings.

Date Begin: 08/13/2024 Date End: 08/13/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
655.2	0.25					9" Topsoil				Fill: 0' to 5'
654.9	0.50									
654.7	0.75					0.8				
654.4	1.00					Brown poorly graded SAND; mostly medium to fine sand, trace coarse gravel, moist, Fill				
654.2	1.25			8						
653.9	1.50									
653.7	1.75	A-1			SP					
653.4	2.00									
653.2	2.25									
652.9	2.50					2.5				
652.7	2.75					Brown poorly graded SAND with silt; mostly fine sand, little silty fines, moist, Fill				
652.4	3.00	A-2		6						
652.2	3.25									
651.9	3.50									
651.7	3.75				SP-SM					
651.4	4.00									
651.2	4.25									
650.9	4.50									
650.7	4.75									
650.4	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 241543
Boring No.: B-15
Sheet: 1 of 1

Project: Grand Rapids Public Schools - Renovation of Houseman Field & Briggs Field
Client: C2AE
Location: Grand Rapids, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: MM Rev. By: MD
Coordinates: N=548100.0 E=12777329.3 (MI South ift)
Elevation: 655.7 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings.

Date Begin: 08/13/2024 Date End: 08/13/2024

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
655.5	0.25					6" Topsoil				Fill: 0' to 5'
655.2	0.50					0.5				
655.0	0.75			14		Brown poorly graded SAND; mostly fine sand, trace silty fines, moist, Fill				
654.7	1.00									
654.5	1.25									
654.2	1.50	A-1								
654.0	1.75									
653.7	2.00			15						
653.5	2.25									
653.2	2.50									
653.0	2.75				SP					
652.7	3.00									
652.5	3.25					Grades light brown at 3'				
652.2	3.50									
652.0	3.75									
651.7	4.00			14						
651.5	4.25									
651.2	4.50									
651.0	4.75									
650.7	5.00					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 051660 Boring No.: B-1 Sheet: 1 of 1

Project: Houseman Field Wall Repair Project
Client: Moore and Bruggink, Inc.
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: DF
Field Eng.: MC
Rev. By: MC
Elevation: ft.
Notes: An embankment came to 1' below the wall west of the boring. The boring was 8' +/- above the track and 7.5' east of the wall, 130' north of the Vernon St. centerline.

Date Begin: 3/9/2006 Date End: 3/9/2006

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	9.5
Sampler	SPT	2"	End	9.8
Core			Seepage	NA
Tube			Date	Depth, ft.

Depth Drilled: 15.0 ft.
Plugging Rcrd: Backfilled with excavated soil. Cave-in at 10.0'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
	1	S-1	1.5	3-1-2	SP	9" dark brown clayey topsoil Light brown poorly graded SAND; mostly medium to fine sand, moist	2.5' +/-	
	2							
	3							
	4							
	5	S-2	1.0	2-4-4	CL	Mottled brown lean CLAY; little medium to fine sand, moist	5.5' +/- Low recovery in Samples S-2, S-3, and S-4; possible gravel/cobble.	2.5
	6							
	7	S-3	1.0	2-3-3	SP-SC	Light brown poorly graded SAND with clay; mostly medium to fine sand, few clayey fines, moist		
	8							
	9							
	10	S-4	1.0	3-2-3	SP	Grades without clayey fines, grades wet at 9.5'	Rock in tip of S-4; possible cobble.	
	11							
	12						12' +/-	
	13							
	14							
	15	S-5	1.5	3-4-5	CL	Brownish gray lean CLAY; moist		3.0
	16					End of Boring at 15.0'		
	17							
	18							
	19							
	20							
	21							
	22							
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** Visual estimate following ASTM D 2488 unless laboratory testing has been performed*

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 051660 Boring No.: B-2 Sheet: 1 of 1

Project: Houseman Field Wall Repair Project
Client: Moore and Bruggink, Inc.
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: DF
Field Eng.: MC
Rev. By: MC
Elevation: ft.
Datum:
Notes: The wall was 12' high at B-2. The boring was 8' E of the wall and 65' N of Vernon Centerline.

Date Begin: 3/9/2006 Date End: 3/9/2006

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	None
Sampler	SPT	2"	End	None
Core			Seepage	NA
Tube			Date	Depth, ft.

Depth Drilled: 20.0 ft.
Plugging Rcrd: Backfilled with excavated soil. Cave-in at 5.0'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
	1	S-1	1.4	2-3-2	SP	7 1/2" dark brown clayey topsoil Light brown poorly graded SAND; mostly medium to fine sand, moist		
	2							
	3							
	4							
	5	S-2	1.0	1-2-2	SP		Two 1/2" clayey sand seams noted	
	6							
	7	S-3	1.4	1-1-2	SP			
	8							
	9							
	10	S-4	0.9	2-2-2	SP			
	11							
	12						11.5' Driller noted change at 11.5'	
	13							
	14							
	15	S-5	1.5	4-4-7	CL	Grayish brown lean CLAY; moist	Silt lenses every 2" to 4" in Sample S-5	3.5
	16							
	17							
	18							
	19							
	20	S-6	2.0	4-4-7	CL	Grades with some silty fines		2.0
	21					End of Boring at 20.0'		
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							
	30							
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MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 051660 Boring No.: B-3 Sheet: 1 of 1

Project: Houseman Field Wall Repair Project
Client: Moore and Bruggink, Inc.
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: DF
Field Eng.: MC
Rev. By: MC
Elevation: ft.
Notes: The boring was 8' E of the wall and 20' S of the Vernon Centerline. An embankment came within 3' of the wall top on the west side. It was about 13' from grade to the track elevation.

Date Begin: 3/9/2006 Date End: 3/9/2006

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	14.0
Sampler	SPT	2"	End	None
Core			Seepage	NA
Tube			Date	Depth, ft.

Depth Drilled: 15.0 ft.
Plugging Rcrd: Backfilled with excavated soil. Cave-in at 10.0'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%
QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
	1	S-1	1.2	1-1-2	SP	6" dark brown clayey topsoil Light brown poorly graded SAND; mostly medium to fine sand, moist		
	2							
	3							
	4							
	5	S-2	0.4	2-2-2	SP		Poor recovery in Sample S-2 likely due to clay in auger; possible gravel/cobble.	
	6							
	7							
	8							
	9							
	10	S-3	0.9	2-1-3	SP		Poor recovery in Sample S-3; possible gravel/cobble.	
	11							
	12							
	13							
	14				SP	Grades wet	14'	
	15	S-4	1.3	3-4-4	CL	Brown lean CLAY; moist		3.0
	16							
	17					End of Boring at 15.0'		
	18							
	19							
	20							
	21							
	22							
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** Visual estimate following ASTM D 2488 unless laboratory testing has been performed*

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 081449 Boring No.: B-1 Sheet: 1 of 1

Project: Houseman Field
Client: Tower Pinkster
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: CK
Field Eng.: TM
Rev. By: TM
Elevation: 706.5 ft. +/-
Datum:
Notes: 60' N, 48' E of NW corner of NW concession building; within parking lot

Date Begin: 12/23/08 Date End: 12/23/08

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	9.0
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.

Depth Drilled: 10.0 ft.

Plugging Rcrd: Backfilled with compacted cuttings and/or bentoseal. Cave-in at 6.6'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
705.5	1	S-1	0.8	7-9-12		1.5" of HMA	Fill 0' to 4.5'	
704.5	2				SP	Brown poorly graded SAND with gravel; mostly medium to	S-1, S-2, S-3: Poor	
703.5	3					fine sand, little fine gravel, trace silty fines, moist, Fill	recovery, possible	
702.5	4				SP-SM	Brown poorly graded SAND with silt; mostly medium to	coarse gravel or	
701.5	5	S-2	0.8	5-5-5		fine sand, few silty fines, trace fine gravel, moist, Fill	COBBLE.	
700.5	6				SP	Light brown poorly graded SAND; mostly medium to fine		
699.5	7	S-3	1.1	3-4-6		sand; moist		
698.5	8				SP			
697.5	9							
696.5	10	S-4	1.5	4-6-5	SP-SM	Light brown poorly graded SAND with silt; mostly medium		
	11					to fine sand, few silty fines, wet with fine gravel seam at		
	12					10.0'		
	13							
	14					End of Boring at 10.0'		
	15							
	16							
	17							
	18							
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Visual estimate following ASTM D 2488 unless laboratory testing has been performed

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 081449 Boring No.: B-2 Sheet: 1 of 1

Project: Houseman Field
Client: Tower Pinkster
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: CK
Field Eng.: TM
Rev. By: TM
Elevation: 706 ft. +/-
Datum:
Notes: 20' N of north stadium retaining wall, 10' W of center north light pole; within north field area.

Date Begin: 12/23/08 Date End: 12/23/08

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.

Depth Drilled: 10.0 ft.

Plugging Rcrd: Backfilled with compacted cuttings and/or bentoseal. Cave-in at 8.0'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
705.0	1	S-1	0.2	2-2-2	SP-SC	Brown poorly graded SAND with clay; mostly medium to fine sand, few clayey fines, moist with roots (topsoil), Fill	Fill 0' to 4.7' S-1 and S-3: Poor recovery, possible coarse gravel or COBBLE.	
704.0	2							
703.0	3							
702.0	4				SP-SM	Brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist with wood fragments, Fill	2.5' +/-	
701.0	5	S-2	1.5	3-2-3			4.7'	
700.0	6							
699.0	7	S-3	1.0	2-3-4	SP	Light brown poorly graded SAND; mostly medium to fine sand, trace silty fines, moist with possible clay seams	Difficult drilling at 3.0', possible coarse gravel or COBBLE.	
698.0	8							
697.0	9						9.2'	
696.0	10	S-4	1.5	4-4-6	SP-SM	Brown poorly graded SAND with silt; mostly coarse to fine sand, few silty fines, moist	10.0'	
	11							
	12							
	13					End of Boring at 10.0'		
	14							
	15							
	16							
	17							
	18							
	19							
	1							
	2							
	3							
	4							
	5							
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	19							
	20							

** Visual estimate following ASTM D 2488 unless laboratory testing has been performed*

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 081449 Boring No.: B-3 Sheet: 1 of 1

Project: Houseman Field
Client: Tower Pinkster
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: CK
Field Eng.: TM
Rev. By: TM
Elevation: 715.5 ft. +/-
Datum:
Notes: 10' N, 15' W of NE corner of northernmost stadium retaining wall; within north field area.

Date Begin: 12/23/08 Date End: 12/23/08

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	5.5
Sampler	SPT	2"	End	NA
Core			Seepage	5.5
Tube			Date	Depth, ft.

Depth Drilled: 10.0 ft.
Plugging Rcrd: Backfilled with compacted cuttings and/or bentoseal. Cave-in at 8.5'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%
QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
714.5	1	S-1	0.8	3-4-3		6" Topsoil	Fill 0' to 7.5'	
713.5	2				SM	Brown silty SAND; mostly medium to fine sand, little silty	Possible Fill to 10.0'	
712.5	3					fines, moist, Fill	2.5' +/- S-1: Poor recovery,	
711.5	4						4.7' possible coarse	
710.5	5	S-2	1.5	3-6-5	CL	Brown mottled lean sandy CLAY; mostly clayey fines,	5.0' gravel or COBBLE.	2.5
709.5	6					some medium to fine sand, moist with roots, Fill	Possible seepage at	
708.5	7	S-3	1.5	4-5-5	SM	Dark brown silty SAND; mostly medium to fine sand, little	5.5' +/-	
707.5	8					silty fines, moist with roots, Fill	7.5'	
706.5	9				SP-SM	Brown poorly graded SAND with silt; mostly medium to		
705.5	10	S-4	1.5	4-5-5		fine sand, few silty fines, moist, Fill	Possible fill to 10.0'	3.5
					CL	Brown mottled lean CLAY; mostly clayey fines, trace medium to fine sand, moist, possible Fill		
						End of Boring at 10.0'		

** Visual estimate following ASTM D 2488 unless laboratory testing has been performed*

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 081449 Boring No.: B-4 Sheet: 1 of 1

Project: Houseman Field
Client: Tower Pinkster
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: CK
Field Eng.: TM
Rev. By: TM
Elevation: 714.2 ft. +/-
Datum:
Notes: 20' S, 20' W of SE corner of east edge of NW concessions building; within stadium area.

Date Begin: 12/23/08 Date End: 12/23/08

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	19.0
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.

Depth Drilled: 20.0 ft.

Plugging Rcrd: Backfilled with compacted cuttings and/or bentoseal.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
713.2	1	S-1	0.8	6-6-6		8" of HMA	Fill 0' to 11.5' +/-	
712.2	2				SP	Brown poorly graded SAND with gravel; mostly coarse to fine sand, little fine gravel, trace silty fines, moist, Fill	1.7' +/- S-1, S-2: Poor recovery, possible coarse gravel or COBBLE.	
711.2	3							
710.2	4							
709.2	5	S-2	0.0	3-4-4	SC	Brown clayey SAND; mostly medium to fine sand, little clayey fines, moist with brick fragments at 5.0', Fill	5.8'	
708.2	6							
707.2	7	S-3	1.5	4-4-4	CL	Brown lean CLAY; mostly clayey fines, trace medium to fine sand, moist, Fill	6.5' +/- S-2: No recovery, additional split spoon driven from 4.5' to 6.0' with 0.2' of recovery.	2.3
706.2	8							
705.2	9							
704.2	10	S-4	1.5	2-2-2	SP-SM	Brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist with occasional clay seams, Fill		
703.2	11							
702.2	12						11.5' +/- Spoons S-4, S-5, and S-6 wet upon retrieval.	
701.2	13					Grades to dark brown from 8.7' to 9.2'		
700.2	14							
699.2	15	S-5	1.5	6-8-7	SP	Brown poorly graded SAND; mostly medium to fine sand, trace silty fines, moist		
698.2	16							
697.2	17							
696.2	18							
695.2	19							
694.2	20	S-6	1.5	3-3-3	SP	Grades wet at 19.0'	20.0'	
	21							
	22					End of Boring at 20.0'		
	23							
	24							
	25							
	26							
	27							
	28							
	29							
	30							
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	39							
674.2	40							

** Visual estimate following ASTM D 2488 unless laboratory testing has been performed*

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 081449 Boring No.: B-5 Sheet: 1 of 1

Project: Houseman Field
Client: Tower Pinkster
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: CK
Field Eng.: TM
Rev. By: TM
Elevation: 714 ft. +/-
Datum:
Notes: 7' S, 15' W of NE Corner of N stadium retaining wall; within stadium area

Date Begin: 12/24/08 Date End: 12/24/08

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	9.5
Sampler	SPT	2"	End	NA
Core			Seepage	6.0
Tube			Date	Depth, ft.

Depth Drilled: 20.0 ft.

Plugging Rcrd: Backfilled with compacted cuttings and/or bentoseal. Cave-in at 11.0'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
713.0	1	S-1	1.5	6-6-5		2" of HMA	0.7' Fill 0' to 9.5'	
712.0	2				SP	Brown poorly graded SAND with gravel; mostly coarse to	1.2' Possible fill to 20.0'	
711.0	3					fine sand, little fine gravel, trace silty fines, moist, Fill		
710.0	4				SP-SC	Brown poorly graded SAND with clay; mostly coarse to		
709.0	5	S-2	1.5	4-5-5		fine sand, few clayey fines, moist, Fill		
708.0	6				SP-SM	Brown poorly graded SAND with silt; mostly medium to		
707.0	7	S-3	1.5	4-3-2		fine sand, few silty fines, moist, Fill, grades wet from 6'	6.7'	
706.0	8				SC	Brown clayey SAND; mostly medium to fine sand, little	8.0' +/-	
705.0	9					clayey fines, moist, Fill		
704.0	10	S-4	1.5	3-5-5	CL	Brown mottled lean CLAY; mostly clayey fines, few	9.5'	1.75
703.0	11					medium to fine sand, moist, Fill		
702.0	12				ML	Brown SILT mostly silty fines, few fine sand, wet, possible		
701.0	13					Fill	Difficult drilling at	
700.0	14						13.0', possible	
699.0	15	S-5	1.5	6-6-7	ML		14.5' coarse gravel or	2.0
698.0	16				CL/SC	Brown sandy lean CLAY; mostly clayey fines, some	COBBLES.	
697.0	17					coarse to fine sand, trace fine gravel, moist, possible, Fill		
696.0	18							
695.0	19							
694.0	20	S-6	1.5	7-12-15	CL/SC			4.5+
	21							
	22							
	23					End of Boring at 20.0'		
	24							
	25							
	26							
	27							
	28							
	29							
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** Visual estimate following ASTM D 2488 unless laboratory testing has been performed*

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 081449 Boring No.: B-6 Sheet: 1 of 1

Project: Houseman Field
Client: Tower Pinkster
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: CK
Field Eng.: TM
Rev. By: TM
Elevation: 736 ft. +/-
Datum:
Notes: 10' S, 10' W of NE corner of playground retaining wall; within playground area.

Date Begin: 12/31/08 Date End: 12/31/08

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	14.1, 26.7
Sampler	SPT	2"	End	NA
Core			Seepage	14.1
Tube			Date	Depth, ft.

Depth Drilled: 30.0 ft.

Plugging Rcrd: Backfilled with compacted cuttings and/or bentoseal. Cave-in at 19.0'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
735.0	1	S-1	0.9	2-2-2		6" Topsoil	Fill 0' to 11.8' +/-	
734.0	2				SM	Black silty SAND; mostly medium to fine sand, little silty fines; moist with sand seams and asphalt fragments, Fill		
733.0	3							
732.0	4				SM			
731.0	5	S-2	1.1	2-3-3	SP	Brown poorly graded SAND; mostly fine sand, trace fine gravel, trace silty fines, moist, Fill	4.3' S-1, S-2, S-3, S-6: poor recovery,	
730.0	6							
729.0	7	S-3	1.0	2-3-3	SP		7.0' possible coarse	
728.0	8						8.0' +/- gravel or COBBLE.	
727.0	9				SP-SM	Brown poorly graded SAND with silt; mostly fine sand, few silty fines, moist, Fill		
726.0	10	S-4	1.4	3-3-3				
725.0	11				SM	Brown silty SAND; mostly fine sand, little silty fines, moist, Fill	Exterior of S-5, S-6,	
724.0	12						12' +/- S-7 and S-8 wet	
723.0	13						upon retrieval.	
722.0	14							
721.0	15	S-5	1.5	2-3-6	CL	Brown lean CLAY with sand; mostly clayey fines, little coarse to fine sand, moist with gray silt seams and wet sand seams at 14.1' and 14.8'		2.0
720.0	16							
719.0	17						17' +/-	
718.0	18							
717.0	19						Difficult drilling	
716.0	20	S-6	1.2	4-5-5	SP	Brown poorly graded SAND; mostly fine sand, trace silty fines, moist with soft clay lens at 24.9'	between 26.0' and	
715.0	21						27.5', possible coarse	
714.0	22						gravel or COBBLE.	
713.0	23							
712.0	24							
711.0	25	S-7	1.5	3-4-5	SP	Grades wet from 26.7' +/-		
710.0	26							
709.0	27							
708.0	28							
707.0	29							
706.0	30	S-8	1.4	3-5-11	SP			
	31							
	32					End of Boring at 30.0'		
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							

** Visual estimate following ASTM D 2488 unless laboratory testing has been performed*

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 081449 Boring No.: B-7 Sheet: 1 of 1

Project: Houseman Field
Client: Tower Pinkster
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: CK
Field Eng.:
Rev. By: TM
Elevation: 741.5 ft. +/-
Datum:
Notes: 30' S, 5' E of the south central stadium light pole

Date Begin: 12/31/08 Date End: 12/31/08

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.

Depth Drilled: 20.0 ft.

Plugging Rcrd: Backfilled with compacted cuttings and/or bentoseal. Cave-in at 16.0'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
740.5	1	S-1	1.5	3-5-5	SP-SM	Dark brown poorly graded SAND with silt; mostly coarse to fine sand, few silty fines, moist with clay seams and asphalt fragments, Fill	Fill 0' to 12' +/-	
739.5	2						Possible fill to 17' +/-	
738.5	3							
737.5	4							
736.5	5	S-2	1.5	2-3-4	SP-SM		Brick, asphalt, glass	
735.5	6						5.5' +/- and coal fragments	
734.5	7	S-3	1.5	2-2-2	SP-SC	Dark brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, moist, Fill	2.5' +/- to 12' +/-	
733.5	8						8.0' +/-	
732.5	9							
731.5	10	S-4	1.5	2-3-2	SM	Dark brown silty SAND; mostly coarse to fine sand, little silty fines, moist with clay lenses and roots, Fill		
730.5	11							
729.5	12						12' +/-	
728.5	13							
727.5	14							
726.5	15	S-5	1.5	2-3-4	CL	Brown lean CLAY with sand; mostly clayey fines, little medium to fine sand, moist with sandy clay seams		1.8
725.5	16							
724.5	17						17' +/-	
723.5	18							
722.5	19							
721.5	20	S-6	1.5	3-4-5	SP	Brown poorly graded SAND; mostly coarse to fine sand, trace silty fines, moist		
	21							
	22							
	23					End of Boring at 20.0'		
	24							
	25							
	26							
	27							
	28							
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							

** Visual estimate following ASTM D 2488 unless laboratory testing has been performed*

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 081449 Boring No.: B-8 Sheet: 1 of 1

Project: Houseman Field
Client: Tower Pinkster
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: CK
Field Eng.:
Rev. By: TM
Elevation: 741 ft. +/-
Datum:
Notes: 10' E of middle 12' maple on S. side of stadium, directly west of west most tennis court.

Date Begin: 12/31/08 Date End: 12/31/08

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	NA
Sampler	SPT	2"	End	NA
Core			Seepage	5.5 +/-
Tube			Date	Depth, ft.

Depth Drilled: 10.0 ft.
Plugging Rcrd: Backfilled with compacted cuttings. Cave-in at 6.0'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%
QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
740.0	1	S-1	1.5	3-3-3	SM	Dark brown silty SAND; mostly medium to fine sand, little silty fines, trace fine gravel, moist with clay seams and wood fragments, Fill	Fill 0' to 8.0' +/-	
739.0	2							
738.0	3						Possible fill to 10.0'	
737.0	4							
736.0	5	S-2	1.5	2-1-1	SM			
735.0	6						5.5' +/-	1.5
734.0	7	S-3	1.5	4-4-4	CL	Brown lean sandy CLAY; mostly clayey fines, some medium to fine sand, trace fine gravel, moist with wet sand seams at 5.5' +/-, Fill		
733.0	8							
732.0	9							
731.0	10	S-4	1.5	6-7-11	CL	Grades to trace fine sand and no gravel with silt lenses at 8.0' +/-		4.5+
	11							
	12							
	13					End of Boring at 10.0'		
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
701.0	40							

** Visual estimate following ASTM D 2488 unless laboratory testing has been performed*

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 081449 Boring No.: B-9 Sheet: 1 of 1

Project: Houseman Field
Client: Tower Pinkster
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: CK
Field Eng.:
Rev. By: TM
Elevation: 740 ft. +/-
Datum:
Notes: 35' S, 10' W of NE corner of SE concession's building.

Date Begin: 12/31/08 Date End: 12/31/08

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.

Depth Drilled: 20.0 ft.

Plugging Rcrd: Backfilled with compacted cuttings and/or bentoseal. Cave-in at 12'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
739.0	1	S-1	1.5	8-10-6	SP-SM	Brown poorly graded SAND with silt and gravel; mostly medium to fine sand, little fine gravel, few silty fines, moist with concrete fragments, Fill	Fill 0' to 6.8' +/-	
738.0	2							
737.0	3						2.5' +/- S-2: Poor recovery,	
736.0	4					Brown silty SAND with gravel; mostly medium to fine	possible coarse	
735.0	5	S-2	0.5	4-50/0"	SM	sand, little fine gravel, little silty fines, moist with	gravel or COBBLE.	
734.0	6					concrete fragments and clay lenses, Fill	Asphalt fragments	
733.0	7	S-3	1.5	8-7-9	SM		6.8' +/- 5.5' +/- to 6.8' +/-	
732.0	8				CL	Brown lean CLAY; mostly clayey fines, trace fine sand,		
731.0	9					moist with roots and silt lenses		
730.0	10	S-4	1.5	4-8-11	CL			4.5+
729.0	11							
728.0	12							
727.0	13							
726.0	14							
725.0	15	S-5	1.5	3-4-6	CL			3.5
724.0	16							
723.0	17						17' +/-	
722.0	18							
721.0	19							
720.0	20	S-6	1.5	3-3-4	SP	Brown poorly graded SAND; mostly medium to fine sand, trace silty fines, moist		
	21							
	22							
	23					End of Boring at 20.0'		
	24							
	25							
	26							
	27							
	28							
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							

** Visual estimate following ASTM D 2488 unless laboratory testing has been performed*

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 081449 Boring No.: B-10 Sheet: 1 of 1

Project: Houseman Field
Client: Tower Pinkster
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: CK
Field Eng.: TM
Rev. By: TM
Elevation: 707 ft. +/-
Datum:
Notes: 150' N, 180' E of NW corner of NW concessions building; within north field area.

Date Begin: 12/23/08 Date End: 12/23/08

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	NA
Sampler	SPT	2"	End	NA
Core			Seepage	NA
Tube			Date	Depth, ft.

Depth Drilled: 10.0 ft.

Plugging Rcrd: Backfilled with compacted cuttings and/or bentoseal. Cave-in at 8.0'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
706.0	1	S-1	0.8	3-4-5	SP-SC	Brown poorly graded SAND with clay; mostly medium to fine sand, few clayey fines, moist with roots, topsoil, Fill	Fill 0' to 5.0' Possible fill to 9.6'	
705.0	2							
704.0	3				CL	Brown mottled lean CLAY; mostly clayey fines, trace medium to fine sand, moist, Fill	2.5' +/- S-1, S-4: Poor	<0.5
703.0	4						4.0' recovery, possible	
702.0	5	S-2	1.5	3-3-3	SM	Brown silty SAND; mostly medium to fine sand, little silty fines, moist with wood fragments, Fill	5.0' coarse gravel or COBBLE.	
701.0	6							
700.0	7	S-3	1.5	2-4-4	SP-SM	Brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist		
699.0	8							
698.0	9					Grades to trace fine gravel at 7.5'	Difficult drilling at 7.0'. Possible coarse	
697.0	10	S-4	0.8	5-4-4	CL	Brown lean CLAY with sand; mostly clayey fines, little medium to fine sand, moist	9.6' gravel/COBBLE.	1.25
	11							
	12							
	13					End of Boring at 10.0'		
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
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	28							
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	30							
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	32							
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	34							
	35							
	36							
	37							
	38							
	39							
	40							

** Visual estimate following ASTM D 2488 unless laboratory testing has been performed*

MATERIALS TESTING CONSULTANTS, INC.	LOG OF BORING	Project No.: 081449 Boring No.: B-11 Sheet: 1 of 1

Project: Houseman Field
Client: Tower Pinkster
Location: Grand Rapids, Michigan
Drill Type: CME 45T
Crew Chief: CK
Field Eng.: TM
Rev. By: TM
Elevation: 706.5 ft. +/-
Datum:
Notes: 150' N, 310' E of NW corner of NW concessions building; within north field area

Date Begin: 12/23/08 Date End: 12/23/08

	Type	Dia.	Groundwater, ft.	
Casing	HSA	3 1/4"	During	4.5
Sampler	SPT	2"	End	NA
Core			Seepage	4.5
Tube			Date	Depth, ft.

Depth Drilled: 10.0 ft.

Plugging Rcrd: Backfilled with compacted cuttings and/or bentoseal. Cave-in at 8.8'.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% QP = Calibrated Penetrometer Reading (tons/sq.ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*Unified Soil Class.	*DESCRIPTION	REMARKS	QP
705.5	1	S-1	1.5	5-4-3	SP-SM	Brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, trace fine gravel, moist with roots and occasional clay seams, topsoil, Fill	Fill 0' to 10.0'	
704.5	2							
703.5	3							
702.5	4							
701.5	5	S-2	1.5	4-3-4				
700.5	6				SP-SM	Grades wet and without gravel from 4.5'		
699.5	7	S-3	1.5	3-3-3			6.5'	
698.5	8				SC	Brown mottled clayey SAND; mostly medium to fine sand, little clayey fines, moist with silt lenses, Fill	8.0'	
697.5	9							
696.5	10	S-4	1.5	4-5-5	SP-SM	Brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist, Fill		
	11							
	12							
	13					End of Boring at 10.0'		
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
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	37							
	38							
	39							
	40							

** Visual estimate following ASTM D 2488 unless laboratory testing has been performed*

Materials Testing Consultants, INC.
693 Plymouth NE • Grand Rapids, MI 49505
(616) 456-5469 • FAX (616) 456-5784

Project Name: Houseman Field
Client: Tower Pinkster Project No.: 081449

Recorded By: CAW Boring Date: 01-05-09

PAVEMENT CORE/BORING LOG

Boring No.: B-12 Location: West 30 yard line near center of field
Station: Offset:

Pavement Section Thickness		
HMA	3 ½	IN.
Concrete	-	IN.
Gravel	6.0	IN.
Subbase	-	IN.

0"	Turf
3.5"	Asphalt
9.5"	Brown poorly graded GRAVEL with sand; mostly fine gravel, some coarse to fine sand, moist, Fill
	Light to dark brown poorly graded SAND with clay; mostly medium to fine sand, few clayey fines, trace fine gravel; moist with brick fragments, Fill
4.0'	Light brown poorly graded SAND; mostly fine sand, trace silty fines, trace fine gravel, moist with brick fragments, Fill
8.0'	Brown lean CLAY; mostly clayey fines, few fine sand, moist (soft consistency) q_p 0.5 tsf
	E.O.B.

Water Level During Drilling: Seepage at 8.0'

Pavement Condition: Asphalt in good condition.

Laboratory Results: None

Remarks: Refusal at 8.0' due to caving wet sand.

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Project Name: Houseman Field
Client: Tower Pinkster Project No.: 081449

Recorded By: CAW Boring Date: 01-05-09

PAVEMENT CORE/BORING LOG

Boring No.: B-13 Location: East 26 yard line near center of field
Station: Offset:

Pavement Section Thickness		
HMA	3.0	IN.
Concrete	-	IN.
Gravel	6.0	IN.
Subbase	-	IN.

0"	Turf
3"	Asphalt
	Brown poorly graded GRAVEL with sand; mostly fine gravel, some coarse to fine sand, moist, Fill
9"	
	Brown to black silty SAND with gravel; mostly coarse to fine sand, little fine gravel, little silty fines, moist, Fill
2.5'	
	Light brown poorly graded SAND; mostly medium to fine sand, trace silty fines, moist, possible Fill
7.0'	
	Brown lean CLAY; mostly clayey fines, few fine sand, moist
8.0'	
	E.O.B.

Water Level During Drilling: Seepage at 7.0'

Pavement Condition: Asphalt in good condition.

Laboratory Results: None

Remarks: Refusal at 8.0' due to caving wet sand.

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Project Name: Houseman Field
Client: Tower Pinkster Project No.: 081449

Recorded By: CAW Boring Date: 01-19-09

PAVEMENT CORE/BORING LOG

Boring No.: B-14 Location: As shown on boring location plan
Station: Offset:

Pavement Section Thickness		
HMA	-	IN.
Concrete	-	IN.
Gravel	-	IN.
Subbase	-	IN.

0"

Light brown poorly graded SAND; mostly medium to fine sand, trace silty fines, moist, Fill

9.0'

Light brown lean CLAY with sand; mostly clayey fines, little medium to fine sand, moist possible Fill (soft consistency)

10.0'

E.O.B.

Water Level During Drilling: None

Pavement Condition: None

Laboratory Results: None

Remarks: B-14 re-located 10' east of original location.

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Project Name: Houseman Field
Client: Tower Pinkster Project No.: 081449

Recorded By: CAW Boring Date: 01-16-09

PAVEMENT CORE/BORING LOG

Boring No.: B-15 Location: As shown on boring location plan
Station: Offset:

Pavement Section Thickness		
HMA	-	IN.
Concrete	-	IN.
Gravel	-	IN.
Subbase	-	IN.

0"

Brown poorly graded SAND with silt; mostly coarse to fine sand, few silty fines, moist, Fill

10.0'

E.O.B.

Water Level During Drilling: None

Pavement Condition: None

Laboratory Results: None

Remarks: None

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Project Name: Houseman Field
Client: Tower Pinkster Project No.: 081449

Recorded By: CAW Boring Date: 01-16-09

PAVEMENT CORE/BORING LOG

Boring No.: B-16 Location: As shown on boring location plan
Station: Offset:

Pavement Section Thickness		
HMA	-	IN.
Concrete	-	IN.
Gravel	-	IN.
Subbase	-	IN.

0"	Dark brown silty SAND; mostly medium to fine sand, little silty fines, trace fine gravel, moist, Fill
5.5'	Brown silty SAND; mostly medium to fine sand, little silty fines, moist with frequent clay seams and glass fragments, Fill
7.0'	Light brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist with occasional clay seams, possible Fill
9.0'	E.O.B.

Water Level During Drilling: None

Pavement Condition: None

Laboratory Results: None

Remarks: Hand auger refusal at 9.0' due to obstruction (possible concrete footing).

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Project Name: Houseman Field
Client: Tower Pinkster Project No.: 081449

Recorded By: CAW Boring Date: 01-19-09

PAVEMENT CORE/BORING LOG

Boring No.: B-17 Location: As shown on boring location plan
Station: Offset:

Pavement Section Thickness		
HMA	-	IN.
Concrete	-	IN.
Gravel	-	IN.
Subbase	-	IN.

0"
1.5' Light brown sandy lean CLAY; mostly clayey fines, some coarse to fine sand, moist with roots, Fill

Brown clayey SAND; mostly medium to fine sand, little clayey fines, moist, Fill

6.5' Light brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist, possible Fill

10.0' E.O.B.

Water Level During Drilling: None

Pavement Condition: None

Laboratory Results: None

Remarks:

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Project Name: Houseman Field
Client: Tower Pinkster Project No.: 081449

Recorded By: CAW Boring Date: 01-19-09

PAVEMENT CORE/BORING LOG

Boring No.: B-18 Location: As shown on boring location plan
Station: Offset:

Pavement Section Thickness		
HMA	12	IN.
Concrete	-	IN.
Gravel	-	IN.
Subbase	-	IN.

0"
12" of asphalt

1.0'
Light brown lean CLAY with sand; mostly clayey fines, little medium to fine sand, moist, possible Fill — q_p = 4.5 tsf

Grades with wet sand seams from 3'

7.0'
E.O.B.

Water Level During Drilling: Seepage at 3.0'

Pavement Condition: Asphalt was easily broken using hand auger equipment.

Laboratory Results: None

Remarks: Auger refusal encountered at 7.0' on obstruction (possible concrete footing).

Materials Testing Consultants, INC.
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Project Name: Houseman Field
Client: Tower Pinkster Project No.: 081449

Recorded By: CAW Boring Date: 01-16-09

PAVEMENT CORE/BORING LOG

Boring No.: B-19 Location: As shown on boring location plan
Station: Offset:

Pavement Section Thickness		
HMA	-	IN.
Concrete	4.0	IN.
Gravel	-	IN.
Subbase	-	IN.

0"
4" of concrete

Light brown poorly graded SAND; mostly fine sand, trace silty fines, moist, Fill

7.0'
Light brown lean CLAY with sand; mostly clayey fines, little coarse to fine sand, moist, possible Fill

8.5'
E.O.B.

Water Level During Drilling: Seepage at 8.5'

Pavement Condition: Concrete core broken in half upon retrieval. Steel reinforcement 2" below top of concrete.

Laboratory Results: None

Remarks: Refusal at 8.5' due to caving sand.