FANNING HOWEY

Project Manual

South Putnam High School Track and Field Renovation

South Putnam Community School Corporation
Greencastle, Indiana

MKS
MICHAEL KINDER & SONS
PLAN | DESIGN | BUILD

Project No. 222152.06
Book 2 of 2
Divisions 03 - 33
January 30, 2024

PROJECT TITLE PAGE

South Putnam High School Track and Field Renovation

South Putnam Community School Corporation
Greencastle, Indiana

Project No. 222152.06

Architects/Engineers

Fanning/Howey Associates, Inc.
350 E. New York St.
Suite 300
Indianapolis, IN 46204
Phone No. 317/848-0966

Electrical Engineers

Creative Engineering Solutions
201 S. Rural Street
Suite 210
Indianapolis, Indiana 46201

Civil

HWC Engineering
135 N. Pennsylvania Street
Suite 2800
Indianapolis, Indiana 46204

Construction Manager

Michael Kinder and Sons
6055 Innovation Blvd.
Fort Wayne, Indiana 46818

END OF PROJECT TITLE PAGE

DOCUMENT 00 01 10 - TABLE OF CONTENTS

Book 1 of 1

INTRODUCTORY INFORMATION

END OF TABLE OF CONTENTS

SOUTH PUTNAM HIGH SCHOOL TRACK & FIELD RENOVATIONS

NOTICE TO BIDDERS

Notice is hereby given that the South Putnam Community School Corporation and Michael Kinder & Sons, Inc, (CMa) have entered into a contract pursuant to which Michael Kinder & Sons, Inc. will be providing all of the Construction Manager as advisor service in connection with the South Putnam High School Track & Field Renovations. Accordingly, Michael Kinder and Sons, Inc. will be receiving sealed bids from qualified contractors, as determined by Michael Kinder and Sons, Inc. in its sole and complete discretion, for the work and supply of materials for the South Putnam High School Track & Field Renovations.

South Putnam HS Track & Field Renovations contractors bid will be accepted at the South Putnam Community School Corporation, 3999 South US Hwy 231, Greencastle, IN 46135 until 2:00 p.m. (local time) on February 29, 2024. Bids received prior to 2:00 p.m. (local time) on February 29, 2024 must be mailed and/or delivered to the South Putnam Community School Corporation administration office for and on behalf of Michael Kinder and Sons, Inc. Bids will be opened and read aloud immediately after 2:00 p.m.

Bid Package is as follows:

1. Bid Package 32a – Track & Football Field Renovations

A Pre-Bid Conference will be held on February 15, 2024, at 10:00 a.m. local time, at South Putnam Middle School/High School, 1780 East U.S. Hwy 40, Greencastle, IN 46135.

All bidding and construction shall be in accordance with construction documents prepared by Fanning Howey all of the terms and conditions of which are incorporated herein by reference. Bidders desiring digital access to construction and bidding documents shall email Larry Easterday of Michael Kinder and Sons, Inc. at leasterday@kindewrandsons.com to receive digital access at no costs. Bidders desiring printed documents shall pay for their own cost of printing, shipping, and handling.

Each bid shall include with such bid, a certified check or bid bond made payable to South Putnam Community School Corporation for an amount not less than five percent (5%) of the maximum bid. Should a successful bidder withdraw its bid or fail to execute a satisfactory contract with South Putnam Community School Corporation, South Putnam Community School Corporation may then declare the bid deposit or bid bond to be forfeited as liquidated damages.

Each successful bidder shall enter into a contract with South Putnam Community School Corporation.

Each successful bidder will be required to furnish Performance & Payment Bonds which cover faithful performance of the contract and the payment of all obligations arising thereunder. Said bonds shall remain in full force and effect for one year from the substantial completion of the Work. The bonds will be made out to South Putnam Community School Corporation.

The contract will be awarded to the lowest responsive and responsible bidder complying with the conditions for bidding, provided the bid is reasonable and it is to the best interest of South Putnam Community School Corporation.

Bids may be hand delivered and/or delivered by delivery service at the location listed above. Bids not reaching said location by 2:00 p.m. (local time), on February 29, 2024 will be returned unopened to the original bidder.

South Putnam Community School Corporation reserves the right to reject any and all bids or waive any or all informalities, irregularities and/or inconsistencies in, or with respect to, any or all bids.

END OF NOTICE TO BIDDERS

SECTION 00 11 16 - INVITATION TO BID

PART 1 - GENERAL

1.1 PROJECT INFORMATION

A. Notice to Bidders: Qualified bidders are invited to submit bids for Project as described in this Document according to the Instructions to Bidders.

B. Project Identification: SOUTH PUTNAM HIGH SCHOOL TRACK & FIELD RENOVATIONS

1. Project Location: South Putnam High School, 1780 East U.S. Hwy 40, Greencastle, IN 46135

C. Owner: South Putnam Community School Corporation

1. Owner's Representative: Corey Smith, Superintendent.

D. Architect: Fanning Howey Associates, David Roan.

E. Construction Manager: Michael Kinder and Sons, Inc. Doug Kinder & Larry Easterday

F. Project Description: Project consists of replacing roof, replacing organic turf field with synthetic turf field and renovations to the track as denoted on the contract documents.

G. Construction Contract: Bids will be received for the following Work:

1. Track & Turf Replacement, one bid package for all track & turf scope of work.

1.2 BID SUBMITTAL AND OPENING

A. Owner will receive sealed bids until the bid time and date at the location indicated below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:
1. Bid Date: February 29, 2024
2. Bid Time: 2:00 p.m., local time.
3. Location: South Putnam Community School Corporation Administration Office, 3999 South US Hwy 231, Greencastle, IN 46135

B. Bids will be thereafter publicly opened and read aloud.

1.3 BID SECURITY

A. Bid security shall be submitted with each bid in the amount of 5 percent of the bid amount. No bids may be withdrawn for a period of 60 days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

1.4 PREBID CONFERENCE

A. A prebid conference for all bidders will be held at South Putnam High School on February 15, 2024, starting at 10:00 a.m.. Enter Door 1 and meeting will be held in primary conference room. Prospective bidders are requested to attend. Bidders will be allowed to walk through as necessary.

1.5 DOCUMENTS

A. Online Procurement of Contract Documents will be provided to **prospective prime bidders only**. Only electronic sets of documents will be issued. Contact the Construction Manager representative, Larry Easterday, via email, leasterday@kinderandsons.com to request documents.

B. Documents will also be available through Eastern Engineering, Construct Connect, Builders Exchange and The Dodge Room.

C. Bidders desiring printed documents shall pay for their own cost of printing, shipping and handling.

1.6 TIME OF COMPLETION

A. Bidders shall begin the Work on receipt of the Notice to Proceed and shall complete the Work no later than July 31, 2024. If work is not completed, prime contractor will be assessed a $ 5,000.00 per day fine until final completion.

1.7 BIDDER'S QUALIFICATIONS

A. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. A Performance Bond, a separate Labor and Material Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder.

END OF SECTION 00 11 16

_____ **NAME OF BIDDER**

BIDDER REMINDER LIST TO BE COMPLETED AND INCLUDED IN BID PACKAGE FOR REVIEW AT BID OPENING

	YES	NO
Have you properly and completely executed the **Bid Form**?		
Is the **Bid Total** written in both words and figures?		
Are the **Alternate** amounts in both words and figures and noted as **Add or Deduct**?		
Is **PART II** of the bid form completely filled out?		
Is the Signatures Page completely filled out?		
Is the Written **Drug Testing Plan** included?		
Have you enclosed a certified check or **Bid Bond**? (Note: bond must be signed by Surety and Principal)		
If bidding **multiple packages**, a separate envelope with separate bid forms and a separate Bid Bond amount must be included for each package.		
~~If bidding a **Combination Bid,** a separate bid form in a separate envelope indicating on the envelope cover with packages are being combined. A combined amount bid bond is to be included in this envelope as well as any combined alternates for applicable combined bid packages.~~		
Have you included your company's **Financial Statement?** This can be in a separate sealed envelope.		
Will you send Contractors and Products List to the Construction Manager within **48** Hours of the Bid Opening?		
On the outside of the envelope containing your Bid have you indicated: • Name of project • Name of bidder • Bid package number and name. • Date and time of closing of bids		
Did you include duplicate copy of your Bid documents?		

NOTE: IF ANY OF THE REQUIRED BIDDING DOCUMENTS ARE NOT INCLUDED, DATED OR PROPERLY EXECUTED, THE CONTRACTOR'S BID MAY NOT BE ACCEPTED.

CONTRACTOR'S BID FOR PUBLIC WORKS FORM NO. 96
Format (Revised 2013) (Amended for SPCSC project)

SOUTH PUTNAM HIGH SCHOOL TRACK & FIELD RENOVATIONS
BID FORM – PART I

Bidder: _____

Address: _____

Phone: _____ Estimator/Sales Person: _____

Estimator/Sales Person Email: _____

Bid Package Number: _____

Bid Package Title: _____

To: ***SOUTH PUTNAM COMMUNITY SCHOOL CORPORATION***

3999 South U.S. Highway 231

Greencastle, IN 46135

I have received and carefully reviewed the Contract Documents prepared and certified by:

Architect:
Fanning Howey
350 East New York St. Suite 300
Indianapolis, IN 46204
Phone: (317) 848-0966

Construction Manager as advisor:
Michael Kinder and Sons, Inc.
6055 Innovation Blvd.
Fort Wayne, IN 46818
Phone: (260) 744-4359

In submitting this proposal, I agree to the following:

1. To hold my bid open sixty (60) days after receipt of bids.
2. To accept the provisions in the Instructions to Bidders.
3. To enter into and execute a contract in the form contained in this bid package, if awarded on the basis of this proposal, and to furnish Contract Performance, Payment, and Maintenance Bonds. The cost of this bond is included in base bid at this time.
4. To accomplish the Work in accordance with the Contract Documents.
5. To submit Certificates of Insurance for the coverage specified in the Contract Documents.

BID CONFIRMATIONS: I have examined all documents, all drawings and submit the following proposal. I have received either hard copies or via electronic format all bid documents and verify that I have reviewed all available information.

Received and include provisions for the following Addendum Nos. _____

- Reviewed all bid packages provided in Project Manual/Bid Package Description. YES_____NO _____
- Attended Pre-Bid Conference YES _____ NO _____
- Visited the Jobsite YES _____ NO _____
- ~~Acknowledge receipt and reviewed MKS's Subcontract and/or Purchase Order sample that was included in this bid manual and understand that edits to the contract language of the final agreement will not be allowed. Signed contract or checklist are not necessary when submitting a bid but will be required once awarded the contract.~~

  ~~YES_____ NO _____~~

- Bidder has reviewed the Schedule provided and the intent of the schedule can be met:

  YES_____ NO _____

- Bidder has included their Written Drug Testing Plan that covers all employees of the bidder who will perform Work on the public Work project and meets or exceeds the requirements set in IC 4-13-18-5 or IC 4-13-18-6.

  YES_____ NO_____

The undersigned further agrees to furnish a bond or certified check with this Bid for an amount specified in the Notice to Bidders.

If additional units of material included in the contract are needed, the cost of units must be the same as that shown in the original contract if accepted by the governmental unit. If the bid is to be awarded on a unit basis, the itemization of the units shall be shown on a separate attachment.

The successful bidder and its Contractors, if any, shall not discriminate against or intimidate any employee, or applicant for employment, to be employed in the performance of this contract, with respect to any matter directly or indirectly related to employment because of race, religion, color, sex, national origin, or ancestry. Breach of this covenant may be regarded as a material breach of the contract.

CERTIFICATION OF USE OF UNITED STATES STEEL PRODUCTS

(if applicable)

~~I, the undersigned bidder, or agent as a contractor on a public Works project, understand my statutory obligation to use steel products made in the United States (I.C. 5-16-8-2). I hereby certify that I and all Contractors employed by me for this project will use U.S. steel on this project if awarded. I understand that violations hereunder may result in forfeiture of contractual payments.~~

ALLOWANCES: The following allowances are included in my bid as directed by my specific bid package description. List None, if not directed by specific bid package description:

$_____ for _____

$_____ for _____

$_____ for _____

$_____ for _____

BASE BID: I agree to execute the Work of the following Bid Package indicated for the lump sum amount given therein.

BID PACKAGE NUMBER: _____

BID PACKAGE DESCRIPTION: _____

DOLLAR AMOUNT: $_____

DOLLAR AMOUNT WORDS: _____

~~**COMBINATION OF BIDS:** Any bidder desiring to submit a bid combining more than one bid package must first complete the separate bid package bid prior to completing the combination bid. Each combination bid must be submitted on a separate bid form and indicate on the bid form cover which packages are being combined. In addition, each separate combined bid form must include any combined alternates for the applicable combined bid packages.~~

~~COMBINATION BID PACKAGE NUMBERS: _____~~

~~BID PACKAGE DESCRIPTIONS: _____~~

~~COMBINATION DOLLAR AMOUNT: $_____~~

~~COMBINATION DOLLAR AMOUNT WORDS: _____~~

ALTERNATE BIDS

I agree to execute the Work for this Bid Package indicated for the lump sum amount given therein. (MUST CIRCLE ADD or DEDUCT). Base bid amount may be increased or decreased in accordance with such of the following alternate proposals as may be selected. If there is no bid submitted for the alternate, it will be assumed that the alternate has no effect on the bidder's scope of Work.

ALTERNATE BID #1: Full depth track replacement, see note 40 on G1.00.
ADD/DEDUCT ($_____) _____

ALTERNATE BID #2: Provide new 6 inch thick concrete slab on grade, spectator pad, as indicated on G1.00 and G 4.00
ADD/DEDUCT ($_____) _____

ALTERNATE BID #3: Provide enlarged school logo, eagle head and text, with turf area as indicated on G1.00.
ADD/DEDUCT ($_____) _____

ALTERNATE BID #4: State the cost to delete Performance& Payment Bond to Base Bid.
ADD/DEDUCT ($_____) _____

UNIT PRICE BIDS: Following unit costs are to be submitted by the bidder as part of its bid to be included in future potential agreement with intent to utilize these costs for potential future changes as applicable on the project. Each unit cost item is intended to be applicable only to itself. **Each unit cost item is to be all inclusive and therefore, include all overhead & profit. No additional mark-up will be allowed for potential future changes on these unit cost items (if utilized).** If an item does not apply to bidder, bidder is to mark "N/A" or "Not-Applicable."

UNIT PRICE # 1A – Unsuitable Soil Excavation: Unit price shall include removing unsuitable soil material and placing unsuitable soils off site. Unit of measurement shall be in place soils, no excavation swell.

Unit Price: $/CY: _____

UNIT PRICE # 1B – Unsuitable Soil Excavation: Unit price shall include removing unsuitable soil material and placing unsuitable soils on site. Unit of measurement shall be in place soils, no excavation swell.

Unit Price: $/CY: _____

UNIT PRICE # 1C – Unsuitable Aggregate Excavation: Unit price shall include removing unsuitable aggregate material and placing unsuitable aggregate off site. Unit of measurement shall be in place soils, no excavation swell.

Unit Price: $/CY: _____

UNIT PRICE # 2 – Import Engineered Fill: Unit price shall include soil fill replacement from offsite. Price shall include placing in lifts and compacting.

Unit Price: $/CY: _____

UNIT PRICE # 3 – Import Engineered Fill: Unit price shall include importing and compacting #73 Aggregate.

Unit Price: $/CY: _____

UNIT PRICE # 4 – Import Engineered Fill: Unit price shall include importing and compacting #53 Aggregate.

Unit Price: $/CY: _____

UNIT PRICE # 5 – Import Engineered Fill: Unit price shall include importing and compacting #2 Aggregate.

Unit Price: $/CY: _____

UNIT PRICE # 6 – Import Engineered Fill: Unit price shall include importing and compacting #1 Aggregate.

Unit Price: $/CY: _____

UNIT PRICE # 7 – Geogrid: Unit price shall include providing and installing BX 1300 Geogrid in $/SY price – based on minimum 50 SY area.

Unit Price: $/CY: _____

UNIT PRICE # 8 – Small Quantity Asphalt Repair: Unit price shall include place & compact stone aggregate + light duty pavement section – based on minimum 15 SY area.

Unit Price: $/CY: _____

NOTE: These items must be filled in when submitting your bid. All days below refer to <u>calendar</u> days. All lead times greater than 4 weeks after receipt of LOI or contract.

1.
   Material Name/Equipment Name _____
   Shop Drawing Lead Time (calendar days) _____
   Delivery after Approved Shops received (calendar days) _____
2.
   Material Name/Equipment Name _____
   Shop Drawing Lead Time (calendar days) _____
   Delivery after Approved Shops received (calendar days) _____
3.
   Material Name/Equipment Name _____
   Shop Drawing Lead Time (calendar days) _____
   Delivery after Approved Shops received (calendar days) _____
4.
   Material Name/Equipment Name _____
   Shop Drawing Lead Time (calendar days) _____
   Delivery after Approved Shops received (calendar days) _____
5.
   Material Name/Equipment Name _____
   Shop Drawing Lead Time (calendar days) _____
   Delivery after Approved Shops received (calendar days) _____
6.
   Material Name/Equipment Name _____
   Shop Drawing Lead Time (calendar days) _____
   Delivery after Approved Shops received (calendar days) _____
7.
   Material Name/Equipment Name _____
   Shop Drawing Lead Time (calendar days) _____
   Delivery after Approved Shops received (calendar days) _____
8.
   Material Name/Equipment Name _____
   Shop Drawing Lead Time (calendar days) _____
   Delivery after Approved Shops received (calendar days) _____
9.
   Material Name/Equipment Name _____
   Shop Drawing Lead Time (calendar days) _____
   Delivery after Approved Shops received (calendar days) _____
10.
   Material Name/Equipment Name _____
   Shop Drawing Lead Time (calendar days) _____
   Delivery after Approved Shops received (calendar days) _____

BID FORM - PART II

(For projects of $150,000 or more – IC 36-1-12-4)

These statements are to be submitted under oath by each bidder with, and as a part of, its bid. (Attach additional pages for each section as needed.)

SECTION I EXPERIENCE QUESTIONNAIRE

1. ***What public Works projects has your organization completed for the period of one*** (1) year prior to the date of the current bid?

Contract Amount	Class of Work	Completion Date	Name and Address of Owner

2. What public Works projects are now in process of construction by your organization?

Contract Amount	Class of Work	Completion Date	Name and Address of Owner

3. Have you ever failed to complete any Work awarded to you?_____ If so, where, and why?

_____

_____

_____

4. List references from private firms for which you have performed Work.

_____

_____

_____

SECTION II PLAN AND EQUIPMENT QUESTIONNAIRE

1. Explain your plan or layout for performing proposed Work. (Examples could include a narrative of when you could begin, complete the Work, number of Workers, etc. and any other information which you believe would enable the Construction Manager to consider your bid.)

2. Please list the names and addresses of all Contractors (i.e., persons or firms outside your own firm who have performed part of the Work) that you have used on public Works projects during the past five (5) years along with a brief description of the Work done by each Contractor.

3. If you intend to sublet any portion of the Work, state the name, and addresses of each Contractor, equipment to be used by the Contractor, and whether you will require a bond. However, if you are unable to currently provide a listing, please understand a listing must be provided prior to contract approval. Until the completion of the proposed project, you are under a continuing obligation to immediately notify the Construction Manager in the event that you subsequently determine that you will use a Contractor on the proposed Work.

4. What equipment do you have available to use for the proposed Work? Any equipment used by Contractors may also be required to be listed by the Construction Manager.

5. Have you entered into contracts or received offers for all materials which substantiate the prices used in preparing your bid? If not, please explain the rationale used which corroborate the process listed.

SECTION III CONTRACTOR'S FINANCIAL STATEMENT

Attachment of bidder's financial statement is mandatory. Any bid submitted without said financial statement as required by statute shall thereby be rendered invalid. The financial statement provided hereunder to the Construction Manager must be specific enough in detail so that the Construction Manager can make a proper determination of the bidder's capability for completing the Work, if awarded.

SECTION IV CONTRACTOR NON-COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that it has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by the bidder, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to induce anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

The undersigned bidder or agent further says that no person or persons, firms, or corporations has, have, or will receive directly or indirectly, any rebate, fee, gift, commission, or thing of value on account of such contract.

SECTION V OATH AND AFFIRMATION

I HEREBY AFFIRM UNDER THE PENALTIES OF PERJURY THAT THE FACTS AND INFORMATION CONTAINED IN THE FOREGOING BID FOR PUBLIC WORKS ARE TRUE AND CORRECT

Sole Proprietor:

IN TESTIMONY WHEREOF, the bidder has hereunto set his/her hand this_____day of _____2022.

Bidder:_____

Partnership:

IN TESTIMONY WHEREOF, the bidder has hereunto set its hand this_____day of _____2022.

Firm:_____

By:_____

Individual Names:_____

_____

_____

Corporation:

IN TESTIMONY WHEREOF, the bidder has hereunto set its hand this_____day of _____2022.

Corporation:_____

President:_____

Secretary:_____

(SEAL)

ACKNOWLEDGEMENT

STATE OF _____

COUNTY OF _____

Before me, a Notary Public, personally appeared the above-named

_____

Swore that the statements contained in the foregoing document are true and correct.

Subscribed and sworn to before me this_____day of _____2022

_____

Notary Public Name

My Commission Expires:_____ County of Residence: _____

INDIANA CONTRACTOR QUALIFICATION CERTIFICATION

Pursuant to Indiana Code 5-16-13, Contractor hereby certifies that he/she shall be qualified under either IC 4-13-6.4 (Qualification for State Public Works Projects) or IC 8-23-10 (Qualifications of Bidders for Contracts) prior to performing any work on a Sout Putnam Community School Corporation public works project. Contractor further certifies that subcontractors of Contractor awarded subcontracts on a Public Works Contract in excess of $300,000 shall be qualified under the applicable statute. Contractor acknowledges that if he/she violates any of the foregoing qualification requirements, he/she shall be ineligible to bid on Public Works Contracts for such time period as the City determines.

_____
Name of Company

By:_____
(Signature)

_____
(Printed Name)

Title:_____

E-Verify Affidavit

Pursuant to Indiana Code 22-5-1.7, Contractor agrees and shall enroll in and verify the work eligibility status of all newly hired employees of the contractor through the E-Verify program. E-Verify means the electronic verification of work authorization program of the Illegal Immigration Reform and Immigration Responsibility Act of 1996 (P.L. 104-208). Division C, Title IV, s.403(a), as amended, operated by the United States Department of Homeland Security or a successor work authorization program designated by the United States Department of Homeland Security or other federal agency authorized to verify the work authorization status of newly hired employees under the Immigration Reform and Control Act of 1986 (P.L. 99-603). Contractor is not required to verify the work eligibility status of all newly hired employees of Contractor through the E-verify program if the E-Verify program no longer exists.

The undersigned, on behalf of the Contractor, being first duly sworn, deposes and states that the Contractor does not knowingly employ an unauthorized alien. The undersigned further affirms that, prior to entering into its contract with the City, the undersigned Contractor will enroll in and agrees to verify the work eligibility status of all its newly hired employees through the E-Verify program.

_____
Name of Company

By: _____
Title

ACKNOWLEDGEMENT

STATE OF INDIANA)
) SS
COUNTY OF ALLEN)

Before me, a Notary Public, in and for said State and County, personally appeared the within named Company by Name, Title, who being first duly sworn upon his/her oath states that he/she is a duly authorized agent of the Contractor, and as such duly authorized to execute the foregoing Declaration, and acknowledged the same as his/her voluntary act and deed.

WITNESS my hand and sear this _____ day of _____, 20_____.

My Commission Expires: _____

_____
Signature of Notary Public

Resident of _____ County

_____
Printed Name

BACKGROUND CHECK & DRUG TESTING - CERTIFICATE OF COMPLIANCE

This is to certify that_____(contractor name) and all of its sub-contractors have screened and will continue to screen all employees providing services to the owner throughout the duration of the project.

A drug testing program will remain in place throughout the duration of the project.

Background check screening need only occur once at the beginning of the project, as long as the contractor and sub-contractors continually screen new hires and provide documentation of same in the form of re-submission of this form with the new date.

Background check screening shall include a minimum of the following information: local, state and national criminal history records check, sex and violent offender registry check through a website such as www.SafeHiringSolutions.com

_____(Contractor name) shall further report arrest and/or filing of criminal charges against each employee within two business days of the occurrence and the disposition of such arrest or filing of charges throughout duration of project.

Non-compliance with these requirements shall be a breach of a material term of any contract and reason for termination. Personally identifiable information obtained in the implementation of this policy shall not be released except as necessary to implement this policy or to defend a decision made pursuant to it.

_____

Authorized Signature

_____

Date

IRAN INVESTMENT CERTIFICATION

South Putnam Community School Corporation

Track & Football Field Renovations

The undersigned contractor hereby certifies in accordance with I.C. 5-22-16.5-1 et seq., to the above mentioned school corporation, that the undersigned is not engaged in investment activities in Iran as defined in the above cited statute

_____

Signature

_____

Printed Name

DOCUMENT 00 26 00.00 - PROCUREMENT SUBSTITUTION PROCEDURES

1.1 DEFINITIONS

A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.

B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 012500 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.2 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.

1.3 PROCUREMENT SUBSTITUTIONS

A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by A/E; otherwise requests will be returned without action:
   1. Extensive revisions to the Contract Documents are not required.
   2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
   3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

A. Procurement Substitution Request: Submit to Construction Manager and A/E. Procurement Substitution Request must be made in writing in compliance with the following requirements:
   1. Requests for substitution of materials and equipment will be considered if received no later than 10 days prior to date of bid opening.
   2. Submittal Format: Electronically submit each written Procurement Substitution Request, using form bound in Project Manual in accordance with Division 00 Section “Instructions to Bidders”.
      a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.
      b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:
         1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
         2) Copies of current, independent third-party test data of salient product or system characteristics.
         3) Samples where applicable or when requested by A/E.
         4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. 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.

5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

6) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will become necessary to accommodate the proposed substitute.

c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.

d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. A/E's Action:

1. A/E may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. A/E will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. A/E's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT 00 26 00

DOCUMENT 00 26 00.01 - SUBSTITUTION REQUEST FORM
(During Procurement)

To _____ Date: _____

Project _____

We hereby submit for your consideration the following product instead of the specified item(s) for the above project:

Section	Article/Paragraph (Page)	Specified Item

Proposed
Substitution: _____ Model: _____

Manufacturer: _____ Phone: _____

Attach complete technical data including laboratory tests if applicable.

Include complete information changes to Drawings and/or Specifications which proposed substitution require for proper installation.

Fill in Blanks Below, use additional sheets if necessary:

A. Does the substitution affect dimensions shown on Drawings?

_____

B. Will the undersigned pay for changes to building design, including engineering and detailing costs caused by substitution, if any?

_____

C. What effect does substitution have on other trades? _____

_____

D. Differences between proposed substitution and specified item?

_____

E. Manufacturer's guarantees of proposed and specified items are:

_____Same _____Different (explain on attachment)

The undersigned certifies that the function, appearance and quality are equivalent or superior to the specified item.

Submitted By:

_____
Signature

_____
Firm _____
Address _____
_____
Telephone _____
Fax _____
Email _____

For Use by Design Consultant:

Accepted Accepted as Noted
Not Accepted Received too Late
PM _____
Specifier _____
Date _____
Remarks _____
Telephone _____

END OF SECTION 00 26 00.01

SECTION 00 60 00
PROJECT FORMS

1.1 FORM OF AGREEMENT

A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:

a. AIA A132 Standard Form of Agreement Between Owner and Contractor, Construction Manager as Advisor Edition

B. Payment Forms:

1. Schedule of Values Form: AIA Document G703-1992 "Continuation Sheet."
2. Payment Application: AIA Document G702-1992/703-1992 "Application and Certificate for Payment and Continuation Sheet."
3. Exhibit C – Michael Kinder and Sons, Inc. Standard Lien Waivers

END OF SECTION 00 60 00

SECTION 01 12 00
SUMMARY OF MULTIPLE CONTRACTS

Table of Contents

General Notes

Each bid package is responsible for the below items.

1. PROJECT SITE WILL BE 100% HARDHAT & SAFETY GLASSES. ALL CONTRACTORS ARE RESPONSIBLE TO PROVIDE HARDHATS & SAFETY GLASSES TO THEIR EMPLOYEES.
2. Each successful Prime Contractor is required to submit background checks for all onsite staff, including office staff that will be onsite including all lower tier contractors under contract to the Prime.
3. All onsite personnel are required to wear high visibility and high visibility outerwear, each with a company logo, no exceptions.
4. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
    a. Owner Occupancy: Allow for Owner occupancy.
    b. Driveways and Entrances: Keep driveways and entrances outside of construction limits, serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
5. Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.
6. Owners Right to Maintain Operations
    a. During the course of this Project, normal and customary functions and operations must be maintained. The Contract Documents are intended to define a strict separation between the school activities of students and staff from the activities of the construction project.
    b. The Construction Manager, Architect, and Owner will not tolerate any visible or audible actions initiated or responded to by any employees of Contractors on this Project toward any students, teachers, or staff members at the school system. Violators shall be promptly removed from the site.
    c. The Owner intends to instruct students, teachers, and staff to refrain from communications with Contractor's personnel working on this Project. All communication with Owner and staff shall be through the Construction Manager.
    d. Contractors must expend their best effort toward protection of the health, safety, and welfare of occupants on the Owner's property during the course of construction on this Project.
    e. Contractors and Subcontractors shall be subject to such rules and regulations for the conduct of the Work as the Owner may establish. Employees shall be properly and completely clothed while working. Bare torsos, legs and feet will not be allowed.
    f. Possession or consumption of alcoholic beverages or drugs, tobacco or other noxious behavior on the site is strictly prohibited. Violators shall be promptly removed from the site. Smoking is not permitted on school property or within school buildings.
7. The Work shall be performed in accordance with the health, safety and environmental regulations of the authorities having jurisdiction and all federal, state, and local laws.
8. Each bid package is required to understand and adhere to the project schedule, phasing plans and logistic plans.

9. The athletic field work must be completed on July 31, 2024. If work is not complete, liquidated damages of $5,000.00 per day will be deducted from the prime contractor's contract.
10. Where bid documents reference the term "General Contractor" change to "Construction Manager".
11. Each bid package to include all mobilizations and demobilizations required for performance of the Work.
12. Separate prime contracts will be awarded as per the "Multiple Contract Summary Bid Packages". Contractors shall include Work required by the Specifications and Drawings for each contract area defined in the Schedule.
13. The contract will be AIA A132 Contract between Owner and Contractor, Construction Manager as Adviser Edition.
14. Each bid package shall provide protection of existing and new work by others during his operations. The costs associated with repair and/or replacement of materials damaged by his work operations will be the responsibility of the bid package that damaged. Each bid package shall provide adequate protection to all areas of existing finishes to remain during any operations performed under their scope of work.
15. Although specifications are allocated to respective bid packages each bid package must read and understand all contract documents assigned to the other trades.
16. Each bid package includes all work, including coordination with related work performed under other contracts, to result in a functional system or product.
17. Each Bid Package will perform all work in coordination with other trades and the CMa.
18. Use of motor oil or machine oil on or above slab will not be permitted. All lifts are required to be fitted with lift diapers to contain any oil leaks from the equipment. Diapers should be inspected periodically during each day of use.
19. Each Contractor utilizing a pipe cutting or threading tool shall have a sand box or litter box directly under said tool to protect floor from oil staining. Construction Manager reserves the right to immediately dispose of any threading/cutting tool on the project site that is being used without stated boxes underneath.
20. Clean-up is a Safety Priority. Accordingly, daily clean-up, i.e., broom clean, consistently organized and neatly stacked materials, and daily removal of trash to dumpsters by each Prime Contractor is required. No tolerance will be allowed for failure to comply. CMa shall issue one verbal request to the Prime Contractor's Foreman. If corrective action is needed, and if not corrected immediately or as requested, CMa will provide manpower to properly clean the Prime Contractor's area(s) and shall issue a deductive CO for the labor and material cost, plus 15% Administrative Fee.
21. Each bid package is required to give minimum 72 hours written notice prior to any disruption in utilities, roadway, or any other activity that would interrupt the normal operations of the Owner's facilities and shall receive written acknowledgement from CMa before undertaking any such work.
22. Each bid package must coordinate deliveries in advance with CMa project staff on a daily basis. Due to site security, logistics, space limitations, and Owner operations, deliveries that come directly to the site without prior knowledge or proper authorization will be rejected. Any deliveries that block traffic or pose any safety concern whatsoever shall require flagmen provided by responsible bid package. Deliveries must be received and unloaded by each bid package. CMa will not provide labor or equipment to unload deliveries from subcontractors.
23. Each bid package is responsible for obtaining written approval from CMa prior to proceeding with any extra work. If written approval is not received, payment for extra work will not be approved.
24. All bidders are responsible to review and ensure compliance with timeline issued for bidding and construction. Weather (eg. Rainout) days will be made up through longer hours, Saturdays, or

Sunday. Each Prime Contractor is fully obligated to meet the requirements of the project schedule within these constraints.

25. When a bid package is to supply materials that will be installed by another bid package, the bid package supplying materials shall be responsible for submitting lay-out and product shop drawings to comply with project schedule.
26. Detailed notes provided for each bid package are provided for clarification purposes and do not represent a complete listing of scope of work. Bidders are responsible for the work assigned in the bid packages, specification and on the drawings.
27. Any access panels not shown on drawings but required by a bid package will be borne by said bid package.
28. Any wood or metal blocking required by a bid package that is not specifically shown on the drawings will be the responsibility of the said bid package.
29. Bid packages are to remove stickers, labels, clean and provide protection over finished products.
30. All submittals must be submitted per the specifications and in accordance with the project schedule.
31. All bidders must agree to terms and conditions of MKS subcontract agreement as defined in the specifications.
32. Building is not to be used for material storage. All materials are to be stored in trailers or off site until needed for installation. Preferably materials should be delivered just in time for installation in accord with the project schedule.
33. Punch list Work – Upon delivery of a “Completion List” by CMa and later a punch list by the Architect, Engineer, and Owner each bid package shall provide a “Punch list Crew” as required to address open items and shall staff the crew with sufficient manpower of persons to complete all Punch list items within 5 days. Subcontractor to provide sufficient manpower that does not take away from other work required by the Project Schedule. Once in the Punch list Phase, CMa will hold weekly punch list meetings and require the Subcontractors punch list crew lead employee to attend, update progress, and coordinate with other trades as needed.
34. All closeout documentation is required to be submitted within 30 days of substantial completion. Final payments will not be made until all closeout documentation is received.
35. If temporary roof protection is not in place, each contractor accessing or traversing the roof is responsible for protection of the roof membrane. Contractors will be held liable for any damages resulting from failure to protect.
36. See Logistics Plan for staging areas.
37. The project worksite is TOBACCO FREE! The use of tobacco, smoking, chewing, vaping, E-cig and sunflower seeds on the site will not be permitted. Anyone who violates will be removed from the project.
38. Project is tax exempt.

Bid Package 32a Track & Turf Field

Specifications: *Unless noted otherwise, this bid package is to provide the entire scope required of each specification listed.*

Division 00 Procurement and Contracting Requirements	Division 01 General Requirements
Division 10 Specialties	Division 11 Equipment
Division 26 Electrical	Division 31 Earthwork
Division 32 Exterior Improvements	Division 33 Utilities

Supplemental Instructions to this Bid Package:

This bid package shall include, but shall not be necessarily limited to, the following scope of work:

1. This bid package is responsible for the labor, materials, supervision, taxes, insurance, equipment, placing, hoisting, scaffolding, protection, transportation, permits (MKS to provide general permit) licenses, fees necessary to complete this scope of work.
2. All spoils generated by this bid package to be removed from the property by this bid package.
3. This bid package is responsible for all layout, both line and grade, for all work by this bid package.
4. This bid package is responsible for locating existing utilities
5. This bid package to include full time supervision during the duration of the project.
6. This bid package is responsible for coordinating all work on project with CMa and SPCSC staff.
7. This bid package is responsible for maintaining the construction schedule.
8. This bid package is responsible for conducting biweekly progress meetings for the duration of the project. Main topics include coordination and schedule.
9. This bid package is responsible for coordinating the work covered in this bid package.
10. This bid package is responsible for furnishing dumpsters for the duration of the project.
11. This bid package is responsible for coordinating use of the existing track perimeter fence to serve as the construction fence for the longest duration possible.
12. This bid package is responsible for furnishing temporary toilets during the duration of the project.
13. This bid package is to include an allowance of $ 50,000.00 for use during construction.
14. This contractor is responsible for completing the bid form including all alternates as applicable.
15. See attached Supplemental Conditions “Exhibit A”, “Exhibit C”, and “Exhibit D” which will be part of the Contract Agreement between MKS and this work package.

Project Specific Scope

1. This bid package is responsible for providing a warranty for Motz turf system (material provided by owner) as denoted in the contract documents. Contact Stephen Torbeck, (513) 227-7786.
2. This bid package is responsible for dust mitigation for the duration of the work.
3. All construction traffic is to enter track on gravel road behind the bus barn.
4. This bid package is responsible to repair any damage to road (asphalt or gravel) created by this construction.
5. This bid package is responsible for brooming roads if trucks track mud during hauling.
6. This bid package is responsible for confirming the exact location of utilities either by third party locator or potholing. Any costs borne from damage created by the work of this package will be paid by this bid package. This package is responsible to show all existing utility locations on closeout documents.

7. This bid package is responsible for asphalt paving / aggregate base investigation as denoted on the contract documents.
8. This bid package is responsible for protecting existing utilities as denoted on the contract documents.
9. This bid package is responsible for protecting the track during construction.
10. This bid package is responsible for protecting perimeter fence at the track. If track resurfacing contractor requires removal, this package is responsible to remove, provide storage and replace fabric on poles after track surface is completed.
11. This bid package is responsible for protection of scoreboard as denoted on the contract documents.
12. This bid package is responsible for protection of water spigot and water access line point during construction.
13. This bid package is responsible for protection of the shot put and discus throw event area.
14. This bid package is responsible for protection of bleachers and pressbox.
15. This bid package is responsible for removal, protection and reinstallation of the time clocks as denoted on the contract documents. This package is to provide safe storage during construction of the turf field.
16. This bid package is responsible for sawcutting asphalt track perimeter and disposing debris.
17. This bid package is responsible for demolition and disposal of existing track events, high jump area and goal posts as denoted on the contract documents.
18. This bid package is responsible for demolition and disposal of subsiding track section noted to be replaced as denoted on the contract documents (see Note 25 on G1.00).
19. This bid package is responsible for sawcutting and removing the D zone on the north side.
20. This bid package is responsible for removing goal posts and turning these over to the owner as denoted on the contract documents.
21. This bid package is responsible for all earthwork. All spoils are to be removed from the property and legally disposed of.
22. This bid package is responsible for all drainage as denoted on the contract documents including but not limited to new structures and work on existing system.
23. This bid package is responsible for preparing/compacting subgrade for new artificial turf field.
24. This bid package is responsible for preparing/compacting subgrade for new D Zone.
25. This bid package is responsible for preparing/compacting subgrade for new long jump and pole vault event area.
26. This bid package is responsible for new concrete curb and wood nailer on the inside perimeter of the track.
27. This bid package is responsible for preparing subsiding track area on SW side of the track for new pavement.
28. This bid package is responsible for preparing new D Zone for new pavement and concrete.
29. This bid package is responsible for preparing the area inside of the track for new artificial turf.
30. This bid package is responsible for all electrical rough in as denoted on the contract documents.
31. This bid package is responsible for the water access points at the Coach/Team Box Areas and relocated water access near D Zone(Note 17/G1.00).
32. This bid package is responsible for furnishing and installing football / soccer goal system as denoted on the contract documents.
33. This bid package is responsible for furnishing and installing new flagpole and up lighting as denoted on the contract documents.
34. This bid package is responsible for new asphalt paving for patching, at repaired subsiding section and new D Zone as denoted on the contract documents.

35. This bid package is responsible for new long jump event in it's entirety as denoted on the contract documents.
36. This bid package is responsible for new pole vault event in it's entirety as denoted on the contract documents.
37. This bid package is responsible for the high jump concrete pad as denoted on the contract documents.
38. This bid package is responsible for the track renovation as denoted on the contract documents. See Notes on the drawings and specifications.
39. This bid package is responsible for the new track surface as denoted on the contract documents.
40. This bid package is responsible for a complete artificial turf system as denoted on the contract documents.
41. This bid package is responsible for all electrical / telecommunication work as denoted on the contract documents.
42. This bid package is responsible for reseeding all disturbed areas.
43. This bid package is responsible to review alternates and provide pricing for entire scope of work for each alternate.
44. The synthetic turf installer/manufacturer shall demonstrate experience with at least 3 similar projects with contract amounts over $1,500,000.00. Submit information with the bid.
45. The installer/manufacturer shall employ only qualified, experienced supervisors and technicians skilled in the installation of this system. All turf technicians shall be full time statutory employees of the turf manufacturer/installer. Submit resumes of the top 5 technicians and 2 supervisors with the bid.
46. This bid package is responsible for providing all attic stock as denoted in the contract documents.
47. This bid package is responsible for providing maintenance equipment as denoted in the contract documents.
48. This bid package is responsible for providing quote to SPCSC for future maintenance.

Exhibit A Terms and Conditions

SUPPLEMENTAL CONDITIONS:
DEFINITION OF CONTRACTOR – The term "Contractor" wherever it is used herein shall mean Michael Kinder & Sons, Inc.

1. Safety

1.1 The Subcontractor agrees that the prevention of accidents to workmen and property engaged upon or in the vicinity of the Subcontract Work is its responsibility. The Subcontractor agrees to comply with all Federal, State, Municipal and local laws, ordinances, rules, regulations, codes, standards, orders, notices and requirements concerning safety as shall be applicable to the Subcontract Work, including, among others, the Federal Occupational Safety and Health Act of 1970, as amended, and all standards, rules, regulations and orders which have been or shall be adopted or issued thereunder, and with the safety standards established during the progress of the Subcontract Work by the Contractor.

1.2 When so ordered, the Subcontractor shall stop any part of the Subcontract Work which the Contractor deems unsafe until corrective measures satisfactory to the Contractor have been taken. The Subcontractor agrees that it shall not have nor make any claim for damages arising from such stoppages. Should the Subcontractor fail to take appropriate corrective measures in a timely manner, the Contractor may do so at the cost and expense of the Subcontractor and may deduct the cost and expense thereof from any payments due or to become due to the Subcontractor. Failure on the part of the Contractor to stop unsafe practices shall in no way relieve the Subcontractor of its responsibility therefore.

1.3 **Safety Training and Competent or Qualified Person.** Each worker sent to perform specific duties on the project will have required training and/or competency to meet all applicable Federal, State, and local regulations. Proof of training shall be submitted to the Contractor's Safety Director prior to commencement of work if requested. Tasks which require the appointment of a Qualified or Competent Person shall have credentials submitted to the Contractor's Safety Director prior to start of work.

1.4 **Subcontractor Injuries and Incidents**. Subcontractor shall notify Contractor of any incident or injury involving an employee of Subcontractor or one of its Subcontractors on the day of the injury or incident. Subcontractor shall complete an Incident Report and Investigation and submit the completed investigation to Contractor within twenty- four (24) hours of the incident or injury. Subcontractor agrees that all injuries and incidents will be investigated to determine root cause, corrective action, and preventative action to ensure similar injuries or incidents do not occur.

1.5 **Minimum Working Apparel**. Subcontractor agrees that the minimum working apparel includes hardhat meeting the current version of ANSI Standard Z89.1, safety glasses and side shields meeting the current version of ANSI Standard Z87.1, shirt with three inch or longer sleeves, long pants and durable work boots. Refer to the Safety Standard Operating Procedures Plan Personal Protection Equipment Section for more specific requirements.

1.6 **Fall Prevention**. Subcontractor shall comply with the Contractor Fall Protection Policy, which requires that no worker exposed to a fall hazard of six (6) feet or greater will work without one hundred percent (100%) fall protection. Subcontractor will take all practical measures to eliminate, prevent and control fall hazards of six (6) feet or more before resorting to a personal fall arrest system. When personal fall arrest is required, Subcontractor shall provide such proper equipment for this purpose and all necessary instruction and training in the care and use of the equipment, including refresher training. All training shall be documented and made available to Contractor upon request.

1.7 **Silica**. Subcontractor must provide action plan when workers may be exposed to silica beyond the action limit. Provide copy of written exposure control plan, name of competent person, practices to limit exposures, training practices, and medical surveillance for all affected workers

1.8 **Disciplinary Action**. Contractor may issue a written notice to individuals who are observed violating the laws, ordinances, rules, regulations, codes, standards, orders, and requirements noted under Regulatory Compliance above. Any Subcontractor or Subcontractor personnel who receive three (3) written violation notices within a one (1) year period may be removed from the Project. Individuals may be removed from the Project after one (1) written notice if Contractor determines in its discretion that the violation observed warrants such removal.

1.9 **Hazard Communication**. Subcontractor will provide Contractor with Project specific hazardous material inventory list and Safety Data Sheets (SDS) for each hazardous material Subcontractor or one of its Subcontractors will bring onto the Project site.

1.10 **Utility Locates.** The Subcontractor will follow the provisions of all applicable statutes and ordinances which require persons or firms doing excavation to do so only after giving notice to utility companies and obtaining information on the location of utilities (such as "one-call" systems).

1.11 **Regulatory Inspections**. If Contractor is fined by any regulatory inspection by a Federal, State, County or Municipal agency or body as a result of any act or omission of Subcontractor or one of its Subcontractors, Contractor will deduct the amount thereof and associated costs from any payments due or to become due to Subcontractor.

1.12 **Illegal Acts**. The theft, conversion, misappropriation, unauthorized removal, possession, or use of property or equipment belonging to Contractor, Owner, Subcontractor, or other worker including but not limited to, materials, tools documents, and propriety information is prohibited.

1.13 **General Safety Requirements**

- Subcontractors must observe and follow all posted safety signs.
- Any worker that is involved in an injury or loss event on the job must be drug tested at the expense of their employer and results cleared before they can continue working on the project.
- Subcontractors are expected to supply their own personal protective equipment (PPE).
- Adequate ventilation must be provided when using vapor producing materials or creating high dust levels. Subcontractor must notify Contractor twenty-four (24) hours in advance whenever work is being done that may generate any hazardous odors or dust.
- Subcontractors may not, under any circumstances, operate or disconnect any device used to control building services until permission has been obtained from the Contractor Superintendent.
- The following activities are prohibited on site and are causes for immediate dismissal: Using alcohol or illicit drugs, Fighting or horseplay, Tampering with equipment, Possession of firearms.
- Subcontractor must have a first aid/CPR-trained foreman on site whenever work is being performed.

- Subcontractor will conduct weekly employee toolbox meetings and copy Contractor with material covered and attendance record.
- *No radios or headsets, including cellular phones and earbuds, are allowed in work areas.*
- Subcontractor must submit safety plans and hazard specific work plans to Contractor prior to beginning work when requested.
- Subcontractor's equipment, tools, and personnel must comply with OSHA Safety and Health Regulations for Construction.
- No one under eighteen (18) years of age is allowed to work on or access to Contractor's jobsites.
- Subcontractor shall provide all required safety information of their sub tier subcontractors as required by Contractor or Contractor's insurance provider.
- Subcontractor must immediately correct any unsafe acts or practices brought to its attention.
- Subcontractor will have qualified operators on allequipment.
- Subcontractor will inspect all its equipment per the manufacturer's instructions daily.

The above Safety Requirement items are general in nature and not all inclusive of every situation or condition on Michael Kinder & Sons, Inc. construction projects.

2. Subcontractor Representations

2.1 The Subcontractor acknowledges receipt of all policies/procedures included in the Bid Documents. Subject to applicable law the Subcontractor further agrees to be bound by these policies/procedures as part of this Agreement. The Subcontractor represents and agrees that it has carefully examined and understands this Agreement and the other Subcontract Documents, has investigated the nature, locality and site of the Subcontract Work and the conditions and difficulties under which it is to be performed, and that it enters into this Agreement on the basis of its own examination, investigation and evaluation of all such matters and not in reliance upon any opinions or representations of the Contractor, the Owner or any of their respective officers, agents or employees.

2.2 The commencement of the Subcontract Work by the Subcontractor on the site of the Project shall constitute the legal and binding acceptance by the Subcontractor of this Agreement. For purposes of this paragraph the mobilization of equipment, delivery of materials or the performance of actual labor on the Project site, whichever occurs first, shall constitute a "commencement" of Subcontract Work by the Subcontractor. The Contractor reserves the right, however, to insist on a signed Agreement prior to the making of any payment to the Subcontractor.

3. Bonds

3.1 If required by the Contractor, a Performance Bond and a Separate Payment Bond satisfactory to the Contractor, in its sole determination are required to be furnished in the full amount of the Subcontract Amount. If Bonds are required, they shall be furnished by a surety acceptable to the Contractor, in the full amount of the Subcontract Amount. Subcontractor must also furnish any applicable statutory bonds if required by the state in which the Project is located.

4 Subcontractor Duties

4.1 **Subcontract Work.** The Contractor retains the Subcontractor as an independent contractor, to provide all labor, materials, equipment, and services necessary or incidental to complete the part of the work which the Contractor has contracted with the Owner to provide on the Project as set forth in Scope of Work included in this Agreement, consistent with the Project Schedule and in strict accordance with and reasonably inferable from the Subcontract Documents. The Subcontractor agrees to perform such part of the work (hereafter called "Subcontract Work") for the Project under the general direction of the Contractor and subject to the final approval of the Contractor, Architect/Engineer, or other specified representative of the Owner.

4.2 **Subcontract Documents.** The Subcontract Documents include this Agreement, Agreement between the Owner and the Contractor ("Prime Contract"), including all addenda, modifications, revisions, plans, drawings, specifications, details, together with all general, technical, supplementary and special terms and conditions, any invitations for bids or information for bidders, if any, to the extent applicable, and all other documents listed in or referred to by the Prime Contract. The Contractor and the Subcontractor are mutually bound by the terms of this Subcontract. To the extent the terms of the Prime Contract apply to the work of the Subcontractor, then the Contractor assumes toward the Subcontractor all the obligations, rights, duties and redress that the Owner under the Prime Contract assumes toward the Contractor. In the identical way, the Subcontractor assumes toward the Contractor all the same obligations, rights, duties and redress that the Contractor assumes toward the Owner and Architect/Engineer under the Prime Contract. This Agreement and the rest of the Subcontract Documents are intended to supplement and complement each other and shall, where possible, be so interpreted. However, if any provision of this Agreement irreconcilably conflicts with a provision of the Subcontract Documents, the provision granting greater rights or remedies to the Contractor or imposing the greater duty, standard or responsibility or obligation on the Subcontractor shall govern.

4.3 **Submittals**. Subcontractor shall, at its own expense, prepare and submit to the Contractor such Shop Drawings, Samples, Models and other submittal data for the materials to be furnished hereunder as detailed in the contract documents and as requested by Contractor, such Shop Drawings, Samples, Models and data to be approved in writing by such entities as Contractor may designate before Subcontractor proceeds under this Agreement. Such Documents shall be submitted to Contractor with reasonable promptness and in such sequence to cause no delay in the work or activities of the Contractor or other subcontractors. Any such approval of submittals or the receipt of materials and/or labor or payment therefore pursuant thereto shall in no event constitute an acceptance of such materials and/or labor and shall not limit or impair Contractor's right of inspection or rejection or any other rights or remedies to which Contractor may be entitled or relieve Subcontractor of any of its obligations and warranties hereunder. Subcontractor is responsible for reviewing Specifications prior to submitting any items verifying all Specification / Contract requirements. All submittals must be submitted electronically in .pdf format. All submittals must be submitted and approved prior to any payment to Subcontractor. All items must be submitted within 20 days of Subcontract date. All submittals must have a separate transmittal for each item and be labeled with the specification section. Any delays in material/equipment deliveries associated with delay in submission of submittal data which causes delays in the project schedule will be responsibility of Subcontractor as denoted in Section 1 of this agreement. Subcontractor may also be required to submit hard copies of submittals when requested by Contractor.

4.4 **Design Delegation.** If the Subcontract Documents (1) specifically require the Subcontractor to provide design services and (2) specify all design and performance criteria, the Subcontractor shall provide the design services necessary to satisfactorily complete the Subcontract Work. Design services provided by the Subcontractor shall be procured from licensed, design professionals (the "Designer") retained by the Subcontractor as permitted by the law of the place where the Project is located. The Designer's signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by the Designer. Shop Drawings and other submittals related to the Subcontract Work designed or

certified by the Designer, if prepared by others, shall bear the Subcontractor's and the Designer's written approvals when submitted to the Contractor. The Contractor shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by the Designer.

4.4.1 If the Designer is an independent professional, the design services shall be procured pursuant to a separate agreement between the Subcontractor and the Designer. The Subcontractor-Designer agreement shall not provide for any limitation of liability or exclusion from participation in the multiparty proceedings requirement of Paragraph 20.6. If applicable, the Designer(s) is (are)

The Subcontractor shall notify the Contractor in writing if it intends to change the Designer. The Subcontractor warrants the design furnished by the Designer will be in conformance with the information given and the design concept expressed in the Subcontract Documents. The Subcontractor shall not be responsible for the adequacy of the performance or design criteria required by the Subcontract Documents furnished by the Owner, Architect/Engineer or Contractor

4.4.2 The Subcontractor shall not be required to provide design services in violation of any applicable law.

4.5 **Clean Up.** The Subcontractor is responsible for its own "clean-up" and keeping the Subcontract Work areas "broom clean". If the Contractor determines the Subcontract Work area to be unsatisfactorily cleaned, the Contractor will so advise the Subcontractor. If the Subcontractor fails to commence cleaning procedures within twenty four (24) hours and continue to clean said area to the Contractor's satisfaction, the Contractor may without further notice execute and complete such clean up activities as the Contractor deems necessary and charge the cost to the Subcontractor or deduct such cost from payments due to the Subcontractor. The Subcontractor is responsible to clean the mud and gravel off its vehicles (including vehicles operated by its subcontractors and suppliers) prior to leaving the site. Any mud or gravel that is tracked onto the surrounding roads shall be removed immediately. The Contractor has the right to clean up surrounding roads immediately upon the Subcontractor's failure to do so, the cost of which shall be deducted from the Subcontractor's next payment.

4.6 **Protection of Subcontract Work.** The Subcontractor is responsible for protection of its material, equipment, and installation until the final acceptance by the Owner and the Architect.

4.7 **Protection of the Project.** The Subcontractor shall confine operations at the Project site to areas permitted by the Contractor and shall not unreasonably encumber the Project site with materials or equipment. The Subcontractor is responsible for any damage caused to adjacent property or access roads by the Subcontractor, its subcontractors, or suppliers during the course of the Subcontract Work.

4.8 **Supervision.** All of the Subcontract Work is the sole and absolute responsibility of the Subcontractor; shall be initiated, managed, performed and completed by qualified, competent, skilled and reputable supervisors, administrators, mechanics and laborers, all of which are satisfactory to the Contractor; shall be in full compliance with the Subcontract Documents including this Subcontract; and shall meet the approval and acceptance of the Contractor and the Owner or its authorized representative. Subcontractor shall not change their Superintendent or Project Manager without written approval from the Contractor.

4.9 **Deliveries.** A minimum of twenty-four (24) hours notice is required for all deliveries to the jobsite. Notify Contractor prior to any major deliveries providing ample time for coordination. Deliveries are to be made at the place, in the quantities and at the times specified in instructions set forth herein or in other written instructions, which may from time to time be furnished by Contractor. Contractor may from time to time change, in writing, delivery instructions or direct that shipment or work be temporarily suspended. Subcontractor shall make no commitments for material or production arrangements in excess of the amount or in advance of the time necessary to comply with Contractor's delivery or performance instructions.

4.10 **Layout.** The Subcontractor shall take careful field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Subcontractor with the Contract Documents before the commencement of the Work. Errors, inconsistencies, or omissions shall be reported at once to the Contractor. Each Subcontractor is responsible for its own layout work.

5. Schedule

5.1 Time is of the essence. The Subcontractor shall commence the Subcontract Work under this Subcontract when notified by the Contractor and shall complete the Subcontract Work in a diligent manner in accordance with the Subcontract Documents and the Schedule of Work provided in this Agreement so that progress or completion of the Project will not be delayed and in such a manner that the Contractor, any other subcontractors, and any separate contractors of the Owner shall not be delayed or impeded in their work. The Subcontractor shall participate and cooperate in the development of schedules and other efforts to achieve timely completion of the Subcontract Work by providing information on the timing and sequence of operations so as to meet the Contractor's overall schedule requirements. The Subcontractor shall continuously monitor the Project Schedule including any revisions thereto, and other work on the Project so as to execute the Subcontract Work in accordance with the requirements of the Project Schedule. The Subcontractor agrees to be responsible for, carry out, and perform all time guarantees upon work or materials referred to in the Subcontract Documents relating to any labor performed or material furnished under this Subcontract. If Subcontractor falls behind schedule, all costs to get back on schedule will be the responsibility of the Subcontractor, including additional costs to the Contractor or other subcontractors that are directly affected by the Subcontractors delays. This includes, but not limited to, overtime, additional supervision and project management, delivery expenses, storage fees, and any other cost and expense incurred in an effort to get back on schedule. If Contractor is responsible for Liquidated Damages and Subcontractor causes delay and Liquidated Damages are charged, the costs of Liquidated Damages will be passed onto the Subcontractor. The Project Schedule is subject to change at the direction of the Contractor at no additional cost.

6. Payment

6.1 In consideration of faithful and timely performance by the Subcontractor of all the covenants and the conditions aforesaid, the Contractor agrees to pay the Subcontractor, subject to other provisions hereof, including authorized additions and deletions the "Subcontract Amount" which sum includes all applicable taxes. Payment shall only be due for the portion of the Subcontract Work actually completed to the satisfaction of the Contractor, the Architect and the Owner. Within ten (10) days after receipt by the Contractor of payment from the Owner, the Contractor shall make payment in the amount and to the extent received from the Owner, less ten percent (10%) retainage. However, receipt of payment by the Contractor from the Owner for the Subcontract Work is a condition precedent to the obligation by the Contractor to pay the Subcontractor for the Subcontract Work in accordance with the preceding sentence, and payment for the Subcontract Work will be made to Subcontractor by the Contractor if and only to the extent such payment is received by the Contractor from the Owner. The Subcontractor hereby acknowledges that it relies on its own evaluation of the credit worthiness of the Owner, and not the credit worthiness of the Contractor, with respect to payment for the Subcontract Work, and expressly assumes

the risk of non-payment by the Owner thereof, for any reason including, without limitation, insolvency of the Owner. Notwithstanding Subparagraph 4.2 of this Agreement, the provisions of this Section shall prevail over any conflicting provisions in the Prime Contract. Progress payment applications must be submitted by the Subcontractor each month in an amount equal to One Hundred percent (100%) of the estimated value of the labor, materials and equipment incorporated in the construction and materials and equipment suitably stored at the Project site, less the aggregate of previous payments. The Subcontractor's Affidavit and Waiver of Lien for prior payments must be properly executed by an authorized representative of the Subcontractor and returned to the Contractor prior to issuance of subsequent payments. Subcontractor must use Waiver Forms included as Exhibit "C" to this Agreement. Subcontractor will be required to provide Sub-Subcontractor and Vendor waivers for values exceeding $5,000.00. No other waiver forms other than those in Exhibit "C" will be accepted.

6.3 Each payment request or invoice must be received by the Contractor by the 20th day of the month to be processed with the Contractor's payment application that month. Invoices and payment requests received that are inaccurate or without substantiation, or after said day of the month will be held until corrected and substantiated, and then processed with the following month's payment application. Subcontractor shall submit all applications electronically, in PDF format, to accounts payable at AP@kinderandsons.com.

6.4 The Subcontractor shall submit its request for partial payment conforming to the standard AIA G702/G703 billing form, with schedule of values attached thereto, representing a true and accurate estimate of the Subcontract Work completed, and materials stored during the immediately preceding month or such other immediately preceding period as directed by the Contractor. In addition, if allowed by the Subcontract Documents, all invoices and insurance certificates shall be included for all stored materials in an off-site storage area applicable to the payment request. Materials not onsite can only be billed for as stored materials, if allowed. If requested, Subcontractor shall submit copies of payrolls to document the value of work in place.

6.6 If the Contractor, in its sole discretion, deems it necessary, the Subcontractor agrees to receive each of its progress payments and final payment in the form of multiple checks issued jointly between the Subcontractor's lower tier subcontractors and major material suppliers and the Subcontractor. Lower tier subcontractors that are to receive part or all of their progress payments as joint checks shall additionally submit with their Payment Requests all invoices from each lower tier subcontractor and major supplier and the net payments to be issued to each.

6.7 No partial payment, or certificate, therefore, shall constitute acceptance or approval by the Contractor of the Subcontract Work or material for which the partial payment is made. No partial payment shall constitute a waiver by the Contractor of any right to require fulfillment of all the terms of this Subcontract. Neither the final payment nor any partial payment, nor any certificate for either, shall constitute acceptance by the Contractor of defective work or improper materials or of any element of the Subcontractor's performance determined to be at variance with this Subcontract.

6.8 The Contractor shall have the right to set off any amounts the Subcontractor owes to the Contractor under this Subcontract or bylaw against the remaining balance under this Subcontract, or against any amounts due the Subcontractor under any other agreements with the Contractor.

6.9 **Final Payment.** Final payment by the Contractor to the Subcontractor shall not become due and payable to the Subcontractor until the following express conditions precedent have been met: (1) The completion of the Subcontract Work required by this Subcontract and acceptance of the Subcontract Work by the Contractor, the Owner and the Architect; (2) Final Waiver shall be provided in exchange for final payment; (3) all closeout and warranty documentation provided by the Contract has been submitted to Contractor; and (4) complete and full satisfaction of all claims, demands, disputes and obligations of the Subcontractor arising out of or related to this Subcontract, including those between the Contractor and the Subcontractor and between the Subcontractor and any third party. Should there be any such claim, lien or unsatisfied obligation, whether before or after final payment is made, the Subcontractor shall deliver payment to the Contractor an amount equal to whatever cost the Contractor and/or the Owner must pay to discharge or defend against any such claim, obligation, lien or action brought, or any judgment thereon and all costs, including legal fees and expenses and a 15% Administrative Fee, incurred in connection therewith.

7. Hazardous Materials

7.1 The Subcontractor shall at all times comply with all rules and regulations of any municipality, state or federal environmental protection, and toxic waste and hazardous substances laws, ordinances and regulations, and how they relate to the Subcontract Work, and shall be equally responsible for actions and inactions of subcontractors, sub subcontractors, and any other agents or independent contractors of the Subcontractor. The Subcontractor shall be deemed to, and shall, have included in the Subcontract Amount the containment, removal, disposal or neutralization of all toxic wastes and hazardous substances created, generated, or transported to or from the Project site in conjunction with the Subcontract Work. The Subcontractor will be responsible for identifying toxic wastes and hazardous substances generated, released, caused by or resulting from the Subcontract Work and notifying the Contractor of its presence in writing as soon as it is identified. The terms "toxic wastes" and "hazardous substances" shall have the same meaning as defined under federal environmental laws and regulations. At all times, the Subcontractor shall defend, indemnify, and hold harmless the Contractor from any and all expenses, costs, damages, suits, fines, assessments, penalties and/or causes of action, including attorney's fees through all investigations, negotiations, hearings or appeals, relating to or arising out of the Subcontractor's failure to strictly comply with the terms of this paragraph.

8. Compliance with Laws

8.1 The Subcontractor agrees to be bound by, and at its own costs comply with, all federal, state, and local laws, ordinances, and regulations (the "Laws") applicable to the Subcontract Work, including but not limited to safety, equal employment opportunity, minority business enterprise, women's business enterprise, disadvantaged business enterprise, sexual and racial harassment, and all other Laws with which the Contractor must comply.

8.2 Where prescribed by Law pursuant to direct Federal contracts or Federally-financed or aided contracts, or otherwise required by Law, the Subcontractor agrees the following clauses found in the Subcontract Documents or in the Code of Federal Regulations (CFR) are incorporated in this Subcontract and binding on Subcontractor as if written herein word for word: the clauses entitled "Equal Opportunity Clause" (41 CFR Sections 60-1.4 & 60-4.3); "Affirmative Action Obligations of Contractors and Subcontractors for Disabled Veterans of the Vietnam Era" (41 CFR Section 60-250.4); "Affirmative Action Obligations of Contractors and Subcontractors for Handicapped Workers" (41 CFR Section 60-741.1); "Contract Work Hours and Safety Standards Act-Overtime Compensation"; "Apprentices and Trainees"; "Payrolls and Basic Records"; "Compliance with Copeland Act Requirements"; "Withholding"; "Subcontracts"; "Contract Termination-Department"; "Disputes Concerning Labor Standards"; "Compliance with Davis-Bacon and Related Act Requirements"; and "Certification of Eligibility" and such other clauses as the Federal Government has required by law or contract. Subcontractor agrees to include all such clauses in any non-exempt, lower-tier subcontracts.

8.3 **Immigration Compliance.** The Subcontractor represents and warrants to the Contractor that the Subcontractor is in compliance with, and shall remain

in compliance with, the provisions of the Immigration Reform and Control Act of 1986 (The "Act") and all other Federal, State, and/or local immigration statutes/ordinances, as applicable, including, but not limited to the provisions of the Act prohibiting hiring and continued employment of unauthorized aliens, requiring verification and record keeping with respect to identity and eligibility for employment and prohibiting discrimination on the basis of national origin, United States citizenship, or intending citizen status. The Subcontractor agrees to indemnify the Contractor and to hold the Contractor harmless from all liability, including liability for interest and penalties, the Contractor incurs which results from or is attributable to the Subcontractor's failure to comply with any provisions of the Act, and or applicable Federal, State, and/or local immigration statute/ordinance, including reimbursing the Contractor any monies expended by the Contractor in participating in or responding to any investigation/suit/civil or criminal immigration matter involving the Subcontractor. As it relates to immigration compliance, the Subcontractor shall be responsible for completing any and all required documentation in accordance with requirements put forth by the Owner, Contractor or applicable law.

8.4 The Subcontractor shall be liable to the Contractor and the Owner for all loss, cost and expense attributable to any acts of commission or omission by the Subcontractor, its Sub-Subcontractors at any tier, and its and their respective employees and agents resulting from the failure to comply with Laws, including, but not limited to, any fines, penalties, restitution, judgments, and other damages resulting from such acts of commission or omission.

9. Insurance

9.1 The Subcontractor agrees to procure, pay for, and maintain in full force and effect during the course of the performance of the Subcontract all insurance required by the laws of the state in which the Subcontract Work covered by this Subcontract is being performed, and in such form and amounts as described in in this section and in Exhibit D, whichever is greater, which is attached hereto and incorporated into this Subcontract. Certificates of Insurance on The American Institute of Architect's Form G-705 or other form acceptable to Contractor and Contractor's counsel must be returned to the Contractor with signed Contract Agreement prior to commencement of the Work or receiving any payment on the project. Subcontractor is responsible for the following insurance for protection from claims that may arise out of or result from Subcontractor's operations under this Agreement, whether such operations be by Subcontractor or by any sub-subcontractor, or by anyone directly or indirectly employed by any of them, or by anyone or whose acts any of them may be liable.

(a) Worker's compensation insurance in accordance with statutory laws and with limits as provided by statute.
(b) Comprehensive general liability, including completed operations coverage for a period of three (3) years from the Project Substantial Completion date, products liability coverage (with the Contractor and Owner protected as additional insured), and contractual liability coverage, with limits of not less than
(i) $1,000,000 each occurrence and $2,000,000 in the aggregate per project for bodily injury or death; and (ii) $1,000,000 each occurrence and $2,000,000 in the aggregate per project for property damage.
(c) Automobile insurance with coverage for owned and non-owned vehicles with a combined single limit of $1,000,000 public liability and property damage.
(d) Installation Floater with a combined limit not less than $500,000.
(e) In addition, Subcontractor shall purchase an umbrella policy with minimum limits of $5,000,000 per occurrence. This policy must provide coverage over the underlying liability policies.
(f) Professional Liability with a limit not less than $1,000,000.

Unless Contractor otherwise agrees in writing, the liability policies to be maintained by Subcontractor hereunder shall name Contractor and Owner as additional named insureds. All insurance limits and minimums must be in accord with both the above and/or that noted in the Project Manual/Specifications whichever minimums are greater. All insurance is to be classified as Primary/Non-Contributory (Form #CG7061 or equivalent) and denoted accordingly on Contractor's Insurance Certificate. Subcontractor shall defend, indemnify and hold harmless Contractor and Owner and their agents and employees from and against all claims, damages, causes of action, losses and expenses, including attorney's fees, arising out of or resulting from the performance of the work, provided that such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom; and (2) is caused in whole or in part by any negligent act or omission of Subcontractor or any of Subcontractor's subcontractors, anyone directly or indirectly employed by any of them or for anyone for whose acts any of them may be liable, regardless of whether it is caused in part by a party indemnified hereunder.

9.2 **Waiver of Subrogation**. A Blanket Waiver of Subrogation clause shall be added to the general liability (Policy Form #CG7036) or equivalent; automobile liability (Policy Form #CA0444) or equivalent and worker's compensation (Policy Form #WC000313 or equivalent). The policies shall be in favor of Michael Kinder & Sons, Inc. and this clause shall apply to Michael Kinder & Sons, Inc. officers, agents and employees, with respect to all projects during the policy term.

9.3 **Cancellation of Coverage**. Each policy of insurance shall provide notification to Contractor and Owner at least thirty (30) days prior to any cancellation or modification to reduce the insurance coverage.

9.4 **Sub-Subcontractors**. To the extent that the Subcontractor subcontracts with any other entity or individual to perform all or part of the Subcontractor's Work, the Subcontractor shall require the other Sub-Subcontractors to furnish evidence of equivalent insurance coverage, in all respects, terms and conditions as set forth herein, prior to the commencement of the Work by the Sub-Subcontractor. The Contractor and Owner shall be named as additional insured as detailed below.

9.5 **Blanket Additional Insured on General Liability and Automobile Liability**. Michael Kinder & Sons, Inc., and their affiliates, directors, employees, subsidiaries, representatives, and any other parties as required by this Contract Agreement. They must be listed as certificate holder, and the Contractor and Owner must be protected as additional insured for Ongoing Operations and Products/Completed Operations on the Subcontractor's and any Sub-Subcontractor's Commercial General Liability Policies. The coverage must be primary and non-contributory with respect to the additional insured. The Blanket Additional Insured coverage must be provided by General Liability Policy Form #CG7037 or equivalent and Automobile Liability Policy Form #CA2048 or equivalent.

9.6 The Contractor shall have no duty to the Subcontractor or to any of its insurers or their insurance agents to review any certificates or copies of insurance furnished to the Contractor or to determine whether the terms of each certificate or policy of insurance comply with the insurance-related provisions of the Subcontract. A failure of the Contractor to detect that the Subcontractor has not submitted certificates, or proper certificates, or is otherwise not in compliance with the insurance-related provisions of the Subcontract shall not be construed as a waiver or other impairment of any of the Contractor's rights under such insurance-related provisions.

9.7 If the Subcontractor fails to procure and maintain such insurance, in addition to the option of declaring the Subcontractor in default for breach of a material provision of this Subcontract, the Contractor shall have the right, but not the duty, to procure and maintain the same insurance, or other insurance that provides the Contractor with equivalent protection, and the Subcontractor shall furnish all necessary information to make effective and maintain such insurance. At the option of the Contractor, the cost of said insurance purchased by the Contractor shall be charged against and deducted from any monies then due or to become due to the Subcontractor or the Contractor shall notify the Subcontractor of the cost thereof and the Subcontractor shall promptly pay such cost.

9.8 The Subcontractor shall identify by certificate any Residential, Mold, EIFS, Silica or other major exclusions that impact the Subcontractor's ability to insure its risk. If the Project includes any Residential components or the proposed design includes EIFS systems, then the Subcontractor shall obtain appropriate endorsements acceptable to the Contractor as a condition of this Subcontract.

9.9 The Subcontractor shall at its own expense provide insurance coverage for materials stored off the site after written approval of the Contractor at the value established in the approval, and also for portions of the Subcontract Work in transit until such materials are permanently incorporated into the Project. The risk of loss for material and equipment provided by this Subcontract, whether in a deliverable state or otherwise, shall remain with the Subcontractor. Any damages to the material and equipment or loss of any kind occasioned in transit shall be borne by the Subcontractor, notwithstanding the manner in which the goods are shipped or who pays the freight or other transportation costs.

10. Indemnity

10.1 **General Indemnity.** To the fullest extent allowed by law, the Subcontractor agrees to defend, indemnify and hold harmless the Contractor to the same extent Contractor is obligated to defend, indemnify and hold harmless the Owner. In the absence of such Owner-required defense and indemnification, the Subcontractor shall defend, indemnify and hold harmless the Contractor, the Contractor's other subcontractors, the Architect/Engineer, the Owner and their agents, consultants, members and employees (the Indemnitees) from and against all claims, damages, losses and expenses, including, but not limited to, attorneys' fees, costs and expenses for bodily injury and property damage that may arise from the performance of the Subcontract Work to the extent of the negligent acts or omissions by, or the fault of, the Subcontractor, the Subcontractor's sub-subcontractors or anyone employed directly or indirectly by any of them or by anyone for whose acts or omissions any of them may be liable. The Subcontractor agrees to purchase and maintain contractual liability insurance covering its obligations in this article. These obligations shall not be interpreted to reduce or negate any other rights or obligations of indemnity otherwise existing with regard as to any party or person described in this Article.

10.2 **Patents.** The Subcontractor hereby agrees to defend, indemnify and hold harmless the Contractor and the Owner from and against any and all liability, loss or damage and to reimburse the Contractor and the Owner for any costs, including legal fees and expenses, which the Contractor and the Owner may incur because of claims or litigation on account of infringement or alleged infringement of any letters patent or patent rights by reason of the Subcontract Work, or materials, equipment or other items used by the Subcontractor in its performance.

10.3 **No Limitations.** In furtherance to, but not in limitation of the indemnity provisions in this Subcontract, the Subcontractor hereby expressly and specifically agrees that its obligation to indemnify, defend and hold harmless as provided in this Subcontract shall not in any way be affected or diminished by any statutory or constitutional immunity it enjoys from suits by its own employees or from limitations of liability or recovery under worker's compensation laws.

11. Termination for Convenience

11.1 It is understood that the basic assumption underlying the mutual obligations and responsibilities entered into by the parties to this Subcontract is the continued performance with respect to the Prime Contract that exists between the Contractor and the Owner. If, for any reason, the Prime Contract is breached, rescinded, or terminated, the Contractor shall have the right to immediately terminate this Subcontract. In no event shall the Contractor be obligated to the Subcontractor for any anticipatory profits or any damages incurred by the Subcontractor as a result of the termination of this Subcontract, unless approved and paid by the Owner. The Subcontractor agrees that the Contractor's decision or determination regarding the pro rata share of any monies received from the Owner as damages or compensation for said breach, rescission or termination of the Agreement shall be final and conclusive and that the Subcontractor shall have no claim or cause of action against the Contractor for any reason or greater amount.

11.2 The Contractor shall have the right at any time by written notice to the Subcontractor, to terminate this Subcontract without cause and require the Subcontractor to cease work. In the event of such a termination for convenience, the Subcontractor shall be entitled to payment pursuant to the terms of the Subcontract for the portion of the Subcontract Work actually completed as of the date of termination, together with reasonable costs of demobilization and such other reasonable costs as may be encountered by the Subcontractor and directly attributable to such termination provided that such amount may be reduced by all amounts for which the Subcontractor is liable or responsible. However, the Subcontractor shall only be entitled to profit on that portion of the work actually completed and approved for payment to the date of termination together with retainages withheld from prior payments. The Subcontractor waives any claim for loss of anticipated profits or other damages in the event the Contractor exercises this clause.

12. Failure of Performance

12.1 **Non-Conforming Subcontract Work.** The Subcontractor shall provide sufficient, safe, and proper facilities at all times for inspection by the Architect, the Owner or the Contractor of the Subcontract Work in the field, at shops or at any other place where materials required hereunder are in course of preparation, manufacture, treatment or storage. The Subcontractor shall, within twenty four (24) hours after receiving written notice from the Contractor to that effect, proceed to remove from the site any materials condemned by the Architect, the Owner, or the Contractor, whether worked or unworked, and to take down all portions of the Subcontract Work which the Architect, the Owner or the Contractor has condemned in writing, as unsound or improper, or as in any way failing to conform to the drawings, specifications and addenda and shall take full financial responsibility for all damage caused by such removal. In the event that all or any portion of the Subcontract Work as condemned should be of such a nature, or the time available should be so limited, that in the judgment of the Architect, the Owner or the Contractor it would not be expedient to order the same replaced or corrected, the Contractor, at its option, may deduct from the payments due or to become due to the Subcontractor such amount or amounts as in the opinion of the Architect or the Owner shall represent the difference between the fair and reasonable value of the Subcontract Work so condemned and its value had it been executed in conformity with the Subcontract Documents.

12.2 **Use of Non-Conforming Materials and Remedies.** Any materials and/or labor which at any time, whether before or after delivery, payment and/or utilization in the Project, fail to conform to any descriptions, specifications, or provisions contained in this Contract Agreement, or fail to satisfy any of

Subcontractor's express or implied warranties, or are shipped or delivered other than in the quantities or not at the time and place specified in Contractor's delivery instructions, or other than in containers or packages conforming to Contractor's specifications (or, in the absence of such specifications, in recognized standard containers), or which are otherwise not in conformance with this Contract Agreement shall be deemed "non-conforming materials and/or labor." If Subcontractor provides or utilizes any non-conforming materials and/or labor, Contractor, without limitation of any other right or remedy Contractor may have, may (a) require Subcontractor to repair or replace, at Contractor's option, such materials and/or labor at Subcontractor's expense; or (b) reject, in whole or in part, the materials and/or labor that are the subject of this Contract Agreement and receive credit or refund for such whole or part of the purchase price associated therewith. Non-conforming materials may be held (or returned to Subcontractor), at Subcontractor expense and risk, and shall be replaced by Subcontractor only upon the written request of the Contractor. Contractor may charge to Subcontractor all expenses of unpacking, examining, testing, repacking, storing and reshipping of any such non-conforming materials and/or of inspecting and testing any such non-conforming labor and may also charge to Subcontractor any other incidental or consequential damages suffered by Contractor as a result thereof.

12.3 **Remedies Cumulative.** The remedies provided for in this Contract Agreement are cumulative and shall be in addition to, and not in limitation of, the rights and remedies which may be available to Contractor at law or in equity. No waiver of a breach of any provision of this Agreement shall be effective unless in writing and no such waiver shall constitute a waiver of any other breach or of the same breach at a different time. The exercise by Contractor of the rights provided herein shall not be considered as a waiver of any damages which may be incurred by Contractor or a waiver of any other rights or remedies to which Contractor might be entitled.

12.4 **Notice to Cure.** If the Subcontractor is unable, refuses or fails to supply enough properly-skilled workers, proper materials, correct non-conforming Subcontract Work, or maintain the Schedule of Work, or fails to make prompt payment to its workers, subcontractors or suppliers, or disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, or otherwise is guilty of a material breach of a provision of this Agreement, the Subcontractor shall be deemed in default of this Agreement. If the Subcontractor fails within three (3) business days after written notification to commence and continue satisfactory correction of the default with diligence and promptness, then the Contractor without prejudice to any other rights or remedies, shall have the right to any or all of the following remedies:

12.4.1 to supply workers, materials, equipment and facilities as the Contractor deems necessary for the completion of the Subcontract Work or any part which the Subcontractor has failed to complete or perform after written notification, and charge the cost, including reasonable overhead, profit, attorneys' fees, costs and expenses to the Subcontractor;

12.4.2 to contract with one or more additional contractors to perform such part of the Subcontract Work as the Contractor determines will provide the most expeditious completion of the Subcontract Work, and charge the cost to the Subcontractor; and/or

12.4.3 withhold any payments due or to become due the Subcontractor pending corrective action in amounts sufficient to cover losses and compel performance to the extent required by and to the satisfaction of the Contractor.

12.4.4 terminate the Subcontractor for default by delivering written notice of such termination to the Subcontractor.

12.4.5 to charge to the Subcontractor an Administrative Fee of 15% of all costs incurred by the Contractor in exercising any of the above remedies.

In the event of an emergency affecting the safety of persons or property, the Contractor may proceed as above without notice, but the Contractor shall give the Subcontractor notice promptly after the fact as a precondition of cost recovery.

12.3 **Termination for Default.** If the Subcontractor has been terminated for default, the Contractor may take possession of the Subcontract Work, materials, tools, appliances and equipment of the Subcontractor at the Project site, and through itself or others provide labor, equipment and materials to prosecute Subcontract Work on such terms and conditions as shall be deemed by the Contractor as necessary, and shall deduct the cost, including without restriction all claims, charges, expenses, losses, costs, damages, and attorneys' fees, incurred as a result of the Subcontractor's failure to perform, from any money then due or thereafter to become due to the Subcontractor under this Agreement.

12.3.1 If the Contractor so terminates the employment of the Subcontractor, the Subcontractor shall not be entitled to any further payments under this Agreement and no sum shall be deemed due or to become due to the Subcontractor until Subcontract Work has been completed and accepted by the Owner, all Subcontract requirements have been fulfilled, and payment has been received by the Contractor from the Owner. In the event the unpaid subcontract earnings exceed the Contractor's cost of completion and any and all incidental costs, including administrative, legal and other professional fees, the difference shall be paid to the Subcontractor, but if such expenses exceed the subcontract earnings, the Subcontractor agrees to pay the difference to the Contractor promptly.

12.3.2 If it is determined or agreed that the Contractor wrongfully exercised any option under this Article, the Contractor shall be liable to the Subcontractor solely for the reasonable value of Subcontract Work performed by the Subcontractor prior to such action, including reasonable overhead and profit on the Subcontract Work performed, less prior payments made. Under no circumstances shall the Subcontractor be entitled to recovery of claimed lost future profits.

13. Delays

13.1 Should the progress of the Subcontract Work be delayed, obstructed or interfered with through any fault, action or failure to act by the Subcontractor or any of its officers, agents, employees, subcontractors or suppliers so as to cause any additional cost, expense, liability or damage to the Contractor or the Owner, including legal fees or expenses incurred in defending claims arising from such delay or seeking reimbursement and indemnity from the Subcontractor and its surety hereunder, the Subcontractor and its surety agree to compensate and indemnify the Contractor and the Owner against all such costs, expenses, damages and liabilities.

13.2 In addition, the Subcontractor, at the Contractor's direction and at the Subcontractor's own cost and expense, shall work such overtime as may be necessary to make up for all time lost in the completion of the Subcontract Work and in the completion of the Project due to such delay. Weather days will be made up through longer hours, Saturdays, and/or Sundays. Subcontractor fully obligated to meet the requirements of the project schedule within these constraints. If the Subcontractor fails to make up for the time lost by reason of such delay, the Contractor has the right to use other subcontractors or suppliers and to take whatever other action the Contractor deems necessary to avoid delay in the completion of the Subcontract Work and the Project, the cost of which shall be borne by the Subcontractor. In the event Subcontractor delays timely performance of the Subcontract

Work or to the completion of the Project, either by its acts or omissions, and such delays result in the Contractor being charged by the Owner with actual or liquidated damages, then the Subcontractor shall reimburse the Contractor the full amount of all such damages and charges resulting from the delays caused by the Subcontractor. The Contractor may offset any such damages against the remaining balance due to the Subcontractor on the Subcontract Amount, if any.

13.3 If the commencement and/or progress of the Subcontract Work is delayed without the fault or responsibility of the Subcontractor, the time for the Subcontract Work shall be extended by Subcontract Change Order to the extent obtained by the Contractor from the Owner pursuant to the Prime Contract, and the Schedule of Work shall be revised accordingly.

14. Changes

14.1 Subcontract Changes. The Contractor and the Subcontractor agree the Contractor may make changes to the Subcontract Work, including but not limited to; additions, deletions or revisions. Any changes made to the Subcontract Work involved, or any other parts of this Agreement, shall be by a written Change Order. To the extent that any such change impacts Subcontractor's cost of or time for performance, the Subcontract Amount and Subcontract Schedule shall be equitably adjusted to compensate for such impact. Changes shall be initiated by one of the three methods outlined below, or as provided in the Prime Contract and shall be incorporated into the Subcontract by a Change Order.

14.1.1. **Request for Change Proposal.** A Request for Change Proposal (RFCP) is a written request that informs Subcontractor about a potential change in the Subcontract Work and requests a proposal for the potential change. Subcontractor shall promptly reply with such request. Subcontractor shall not implement the change or incur any costs until a Change Order is fully executed.

14.1.2. **Construction Change Directive.** A Construction Change Directive (CCD) is a written directive that instructs Subcontractor to take some immediate action in connection with the Subcontract Work. CCDs are issued when there is not time to issue a RFCO or Change Order. Subcontractor shall immediately proceed so as not to delay the progress of the Work and in accordance with the terms of the CCD. Any impact of a CCD on the Contract Price or Schedule shall be adjusted by a Change Order.

14.1.3. **Change Order Requests.** Within seven (7) calendar days after the occurrence of any event or observance of any condition that Subcontractor believes entitles Subcontractor to an adjustment in Subcontract Amount and/or Subcontract Schedule, Subcontractor shall prepare and submit a Change Order Request (COR) to Contractor. The COR shall include a detailed factual narrative, a detailed analysis showing entitlement and a detailed analysis of the proposed change to the Subcontract Amount and/or Subcontract Schedule.

14.2 **Change Orders.** A Change Order (CO) is a written instrument prepared by the Contractor and signed by the Subcontractor stating their agreement with the change in the Subcontract Work and any adjustment to the Subcontract Amount and/or Subcontract Schedule. All changes and/or additions in the Subcontract Work ordered in writing by the Contractor shall be deemed a part of the Subcontract Work and shall be performed and furnished in strict accordance with all terms and conditions of this Agreement and the Subcontract Documents, including the current Schedule of Work.

Change Orders will be used to implement approved Requests for Change Proposals, Construction Change Directives and Change Order Requests. Upon receipt of a properly documented COR or CCD, the parties shall negotiate in good faith to determine if the Subcontractor is entitled to a Change Order and, if so, the appropriate equitable adjustment. Any adjustment to the Subcontract Amount shall be established by one of the following methods:

a. mutual acceptance of an itemized lump sum, or
b. unit prices as indicated in the Subcontract Documents or as subsequently agreed to by the parties; or
c. costs determined in a manner acceptable to the parties and a mutually acceptable fixed or percentage fee; or
d. another method provided in the Subcontract Documents.

If the Parties are unable to agree on the dispositions of a COR or CCD, Contractor will either (i) issue a Notice denying Subcontractor's request or (ii) issue a unilateral Change Order setting forth the Contractor's final determination regarding the adjustments. Any cost and schedule adjustments shall be a full accord and satisfaction for all cumulative impacts of the underlying change.

14.3 The Subcontractor shall not be entitled to receive additional compensation for extra work or materials or changes of any kind except to the extent the same was ordered by the Contractor or any of its representatives. The Subcontractor shall be responsible for any costs incurred by the Contractor for changes of any kind made by the Subcontractor that increase the cost of the Work for either the Contractor or other subcontractors when the Subcontractor proceeds with such changes without a Change Order or Construction Change Directive.

14.4 Determination by Owner or Architect/Engineer. Notwithstanding any other provision, if the Subcontract Work for which the Subcontractor claims additional compensation is determined by the Owner or Architect/Engineer not to entitle the Contractor to a Change Order, additional compensation or a time extension, the Contractor shall not be liable to the Subcontractor for any additional compensation or time extension for such Subcontract Work, unless the Contractor agrees in writing to pay such additional compensation or to grant such extension.

15. Claims

15.1 A Claim is a written demand by Subcontractor seeking an adjustment in the Subcontract Amount and/or Subcontract Schedule or some other relief under the terms of the Subcontract for events other than a RFCP that has been denied in writing. Subcontractor shall provide Notice to Contractor of any potential Claim within seven (7) calendar days after the event giving rise to the Claim. Within fifteen (15) calendar days thereafter, Subcontractor shall submit a detailed factual narrative, a detailed analysis showing entitlement and a detailed analysis of the alleged change to the Subcontract Amount and/or Subcontract Schedule. Claims not timely made, in writing, by the Subcontractor shall be deemed to have been abandoned and waived. The acceptance and consideration of any claim out of time by the Contractor shall not create any precedent nor "course of dealing' between the Contractor and the Subcontractor, nor shall it waive the Contractor's right to insist on strict adherence by the Subcontractor to the contract claims procedures. If Contractor denies Subcontractor's Claim, Subcontractor may pursue the matter under Article 21 Dispute Resolution.

15.2 The Subcontractor shall not delay or suspend the Subcontract Work because of the pendency of or the denial by the Contractor of any such claim or because of the continuance of the condition out of which the claim arose, but shall proceed diligently in performing the Subcontract Work while the claim is being resolved by agreement or being fully adjudicated.

15.3 In the event the Subcontractor asserts that it should receive additional compensation because of an act or omission on the Owner's part, or someone for whom the Owner is responsible, the Subcontractor shall promptly submit the claim to the Contractor in writing at least three (3) working days

before the date the Contractor is required to submit such claims under the Prime Contract. If timely submitted with all documentation required by the Prime Contract, the Contractor will, on behalf of the Subcontractor, submit the same to the Owner for its consideration. Failure of the Subcontractor to submit such claims in a timely and proper manner shall result in a waiver of such claim and the Contractor is not required to submit it to the Owner, and the Subcontractor shall be bound to the same consequence which the Contractor would suffer under the Prime Contract.

15.4 The Subcontractor shall fully cooperate with the Contractor in the submission of such pass through claims, shall prepare all supporting data and do everything else necessary to properly present the claims, including payment of legal fees incurred by the Contractor to prepare, submit and negotiate or otherwise resolve such claim. Should the Owner allow and pay additional compensation to the Contractor on account of such pass through claim asserted by the Subcontractor, the Contractor will pay the same to the Subcontractor, less the Contractor's overhead, costs, expenses, legal fees and a 15% Administrative Fee.

15.5 It shall be an express condition precedent to any obligation on the part of the Contractor to make payment of any cost, reimbursement, compensation or damages to the Subcontractor hereunder that the Contractor shall first be determined to be entitled to such compensation on behalf of the Subcontractor and then receive such payment from Owner, and Subcontractor expressly acknowledges that the Contractor is not obligated or required to pursue the Subcontractor's claim against the Owner if the Contractor, in its sole discretion, after review of the Subcontractor's claim, has deemed the claim to lack merit in whole or in part.

15.6 If at any time a controversy should arise between the Contractor and the Subcontractor with respect to any matter in this Subcontract which the Contractor determines is not a claim, dispute or controversy which should involve or be asserted against the Owner, the decision of the Contractor relating to the subject of the controversy shall be followed by the Subcontractor.

16. Taxes

16.1 The Subcontract Amount includes all applicable sales, excise, transportation, unemployment compensation, social security, and any other taxes presently existing or subsequently imposed and levied and the Subcontractor agrees to pay all of the above and to conform to all applicable municipal, state and federal laws in connection with such taxes. The Subcontractor further agrees to withhold taxes from the wages and salaries of all employees of the Subcontractor and pay the same in accordance with the federal and state laws and regulations pertaining thereto. The Subcontract Amount includes federal, state, and municipal taxes now levied or in force or hereafter imposed on any and all tangible personal property sold or transferred to the Contractor under this Subcontract and the Subcontractor agrees to pay such tax or taxes on such property, the cost of which is included in the Subcontract Amount.

17. Liens

17.1 The Subcontractor shall promptly pay when due all its project creditors, together with the project creditors of all those below it in the contractual chain.

17.2 If the Project involves private work, the Subcontractor shall keep the property and improvements free and clear of all mechanic, materialmen and similar lien claims or statements. In the event any such lien is filed, asserted, or claimed, the Subcontractor shall immediately secure its release either by paying the lien claimant, by filing a lien release bond, or by any other means permitted by law. If not so released, the Contractor may retain an amount equal to 150% of the lien or claim and may pay the claimant and offset that amount, plus any legal fees from the amount so retained. If the Project involves public work, the Subcontractor shall promptly pay and secure releases from all of its project creditors, including all those below it in the contractual chain, who are entitled to assert claims against the Contractor or its surety.

17.3 If any claim or lien is made or filed with or against the Contractor, the Owner, the Project, the Premises or the Project funds by any person claiming that the Subcontractor or any subcontractor or other person under subcontract to the Subcontractor, or any person or entity employed or engaged by the Subcontractor at any tier, has failed to make payment for any labor, services, materials, equipment, taxes or other obligations furnished or incurred in connection with the Subcontract Work, or if the Subcontractor or any subcontractor or other person under subcontract to the Subcontractor, or any person or entity employed or engaged by the Subcontractor at any tier causes damage to the Subcontract Work or any other work on the project, or if the Subcontractor fails to perform or is otherwise in default of any term or provision of this Subcontract, the Contractor shall have the right to retain from any payment then due or thereafter due an amount which the Contractor deems sufficient to (1) satisfy, discharge and/or defend against any such claim or lien, (2) make good any such nonpayment, failure, damage or default, and (3) defend, indemnify and hold harmless the Contractor and the Owner against any and all losses, damages and costs, including legal fees and expenses, incurred by either or both of them. The Contractor shall require proof that any such nonpayment, claim or lien is fully satisfied, dismissed, and discharged before any remaining retained funds will be released. The Contractor shall, in addition, have the right to apply and charge against the Subcontractor so much of the amount retained as may be required for the foregoing purposes and the Subcontractor shall pay and reimburse the Contractor and the Owner all such losses, damages, and costs incurred by them which exceed the retained funds.

18. Assignment

18.1 To the fullest extent permitted by law, the Subcontractor agrees that it shall not assign, sell, transfer, delegate or encumber any rights, duties or obligations arising under this Subcontract including, but not limited to, any right to receive payments hereunder, without the prior written consent of the Contractor in its sole discretion and the giving of any such consent to a particular assignment shall not dispense with the necessity of such consent to any further or other assignments. In the event the Subcontractor assigns, sells, encumbers, or otherwise transfers its right to any funds due or to become due under this Subcontract as security for any loan, financing or other indebtedness ("Assignment"), notification to the Contractor of such Assignment must be sent by certified mail, return receipt requested, to the Contractor and the Assignment shall not be effective as against the Contractor until the Contractor provides its written consent to such Assignment. The Subcontractor agrees that any such Assignment shall not relieve the Subcontractor of any of its agreements, duties, responsibilities or obligations under this Subcontract and the Subcontract Documents and shall not create a contractual relationship or a third party beneficiary relationship of any kind between the Contractor and such assignee or transferee.

19. Guarantee/Warranty

19.1 For a period equal to that imposed upon the Contractor under the Prime Contract, but in no event less than one year from the date of the Owner's final acceptance of the Subcontract Work, the Subcontractor guarantees and warrants that the Subcontract Work complies with the Subcontract Documents requirements and is free from defects in material and workmanship. The Subcontractor shall remain liable for defects in the Subcontract Work for the

same period the Contractor remains liable to the Owner under the Prime Contract, or as required by law, whichever is greater. This guarantee/warranty shall include, but is not limited to, the cost of all labor, material, and related items necessary to correct any such defect, plus the cost of repairing any damage to other items which may have been caused by the defective material or workmanship. If the Subcontractor fails to begin warranty work within seventy-two (72) hours of being notified that such work is necessary, the Contractor may, at its option, perform the necessary remedial work or secure its performance by others and charge the Subcontractor with the cost thereof, plus a 15% Administrative Fee. Nothing in this paragraph shall shorten the statute of limitations on any action by the Contractor for breach of contract, negligence, or other cause of action against the Subcontractor.

20. Dispute Resolution

20.1 **Scope of Disputes Provisions.** All Claims, disputes, or other matters in question between the parties to this Subcontract which arise out of or relate to this Agreement (or the breach thereof), whether in contract or tort, (hereinafter "Dispute") shall be subject to the dispute resolutions set forth below.

20.2 **Initial Dispute Resolution/Mediation.** A Dispute which either party desires to pursue shall be set forth in a detailed written statement of claim submitted to the other party providing the specific basis upon which monetary or other relief is claimed to be due, the specific contractual provision(s) supporting the claim and an itemization of the amount claimed to be due. Following submission of the detailed statement of claim, Contractor and Subcontractor shall endeavor to settle the Dispute first through face to face direct discussions between corporate officers of the Contractor and Subcontractor which discussions shall be held at the Contractor's office location involved with the Project within thirty (30) calendar days of a request by either party. If the Dispute cannot be resolved through direct discussions, the parties shall participate in mediation under the Construction Industry Mediation Rules of the American Arbitration Association as a condition precedent and before recourse to any other form of binding dispute resolution. The location of the mediation shall be Allen County, Indiana, unless the parties agree on another location. Upon written notice requesting mediation provided to the other party and the American Arbitration Association, the parties agree to proceed with the mediation as scheduled by the mediator. Either party may terminate the mediation at any time after the first session, but the decision to terminate must be personally delivered to the other party and the mediator.

20.3 Binding Dispute Resolution. In the event Contractor and Subcontractor cannot resolve the Dispute through direct discussions or mediation as contemplated above, then the Dispute shall, at the sole discretion of Contractor, be decided either by submission to (a) arbitration administered by the American Arbitration Association or other arbitration tribunal mutually agreed upon by the parties; or (b) litigation subject to the exclusive jurisdiction and venue of Allen County, Indiana.

20.4 **Arbitration Election**

20.4.1 In the event Contractor exercises its exclusive right to resolve the Dispute in arbitration, such arbitration shall be conducted in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association or the applicable rules of such other arbitration tribunal as the parties may mutually determine in effect at the time the arbitration is commenced as modified by the terms hereof. Any arbitration hereunder shall be held in Allen County, Indiana.

20.4.2 Should Contractor exercise its exclusive right to resolve the Dispute by arbitration, then within fourteen (14) days after Contractor gives Subcontractor notice of Contractor's election of arbitration, the parties shall use good faith efforts to select a single arbitrator mutually acceptable to both parties. If the parties are unable to select an arbitrator, then the parties will select the arbitrator(s) from a panel of experienced construction arbitrators on the American Arbitration Association's large complex case panel or a comparable panel of experienced construction arbitrators maintained by such other arbitration tribunal mutually selected by the parties then in effect. In the event the amount in Dispute exceeds $1,000,000.00, Contractor and Subcontractor agree the arbitration shall be heard by a panel of three (3) arbitrators; otherwise, the Dispute shall be heard by a single arbitrator.

20.4.3 The parties will enter into an Electronically Stored Information Agreement outlining the scope and volume for ESI discovery, which shall take into account the amount and complexity of the Dispute.

20.4.4 The arbitration award shall be final and binding upon the parties, shall include attorneys' fees and costs to the prevailing party or parties, and may be entered as a judgment in any court having proper jurisdiction. In any arbitration the Arbitrator(s) shall have no power to render an award which has the effect of altering or amending or changing in any way any provisions of this Subcontract.

20.4.5 The parties stipulate and agree that the performance of this Subcontract is a transaction involving interstate commerce. Notwithstanding other provisions in the Subcontract, or choice of law provisions to the contrary, this agreement to arbitrate shall be enforced pursuant to, and governed by, the Federal Arbitration Act, 9 U. S. C. §1 et seq., which shall not be superseded or supplemented by any other arbitration act, statute, or regulation.

20.4.6 At the sole discretion of Contractor, any arbitration with Subcontractor shall be consolidated with any other arbitration proceeding relating to the work under the General Contract.

20.5 **Litigation Election.** In the event Contractor elects not to exercise its exclusive right to resolve the Dispute by arbitration, or in the event the Dispute between Contractor and Subcontractor, or any portion thereof, is found to be non-arbitrable, then the parties hereby agree that the Dispute or a portion thereof (as the case may be) shall be subject to exclusive jurisdiction and venue of Allen County, Indiana. In any such Dispute or portion thereof which is resolved by litigation, Subcontractor expressly waives any right to trial by jury.

20.6 **Multiparty Proceeding.** To the extent permitted by Subcontract Documents, all parties necessary to resolve a claim shall be parties to the same dispute resolution proceeding. To the extent Disputes between the Contractor and the Subcontractor involve in whole or in part disputes between the Contractor and the Owner, Disputes between the Subcontractor and the Contractor shall be decided by the same tribunal and in the same forum as disputes between the Contractor and the Owner.

20.7 **Stay of Proceedings.** (a) In the event the provisions for resolution of disputes between the Contractor and the Owner contained in the Subcontract Documents do not permit consolidation or joinder with disputes of third parties, such as the Subcontractor, resolution of any Dispute between Contractor and Subcontractor involving in whole or in part disputes between Contractor and Owner shall be stayed pending conclusion of any dispute resolution proceeding between Contractor and Owner. (b) In the event that any action is filed prior to exhaustion of remedies under the Subcontract; such action shall be stayed pending conclusion of any dispute resolution proceedings.

20.8 **Work Continuation and Payment.** Unless otherwise agreed in writing, Subcontractor shall continue the Subcontract Work and maintain the Schedule of

Work during any dispute resolution proceedings. As Subcontractor continues to perform, Contractor shall continue to make payments in accordance with this Agreement.

20.9 Cost of Dispute Resolution; Attorneys' Fees. The cost of any mediation proceeding shall be shared equally by the parties participating.

20.9.1 The prevailing party in any Dispute arising out of or relating to this Agreement or its breach that is resolved by a dispute resolution procedure designated in the Subcontract Documents shall be entitled to recover from the other party those reasonable attorneys' fees, costs and expenses (including expert fees and expenses) incurred by the prevailing party in connection with such dispute resolution process after direct discussions and mediation.

20.9.2 In the event the Subcontractor is awarded an amount equal to or less than the last written offer of settlement from Contractor, prior to the commencement of binding dispute resolution, Contractor shall be deemed prevailing party and be entitled to recover those reasonable attorneys' fees, costs and expenses (including expert fees and expenses) incurred by the Contractor.

21. Miscellaneous

21.1 No one, other than the parties hereto, their successors, trustees and assigns, shall be entitled to bring action on this Subcontract or the Performance Bond provided by the Subcontractor, it being the express intent of the parties that this Subcontract shall not be for the benefit of any third party.

21.2 Any term or provision of this Subcontract which is held to be invalid or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such invalidity or unenforceability without rendering invalid or unenforceable the remaining terms and provisions of this Subcontract or affecting the validity or enforceability of any of the terms or provisions of this Subcontract in any other jurisdiction.

21.3 This Subcontract, together with the documents referred to or incorporated herein by reference, constitute the complete agreement between the parties. No agent or employee of either party possesses the authority to make, and the parties shall not be bound by nor liable for, any statement, representation, promise or agreement not set forth herein. Any article, section, paragraph, or other headings contained in this Subcontract are for reference purposes and shall not affect in any way the meaning or interpretation of this Subcontract.

21.4 The terms and provisions shall extend to and be binding upon the successors, trustees and assigns of the parties hereto, and shall be governed and controlled, except as expressly provided herein or as required by the Subcontract Documents, by the laws of the State of the Project.

21.5 The Subcontractor agrees to comply with the provisions and any applicable local, state, or federal ordinance, regulation, status, or other mandate regarding affirmative action and/or minority/women's business enterprise participation.

21.6 This subcontract has not been altered in any manner from its original form as sent to the Subcontractor except for required signatures and dates, or as clearly marked and initialed by this Subcontractor. Any changes to this subcontract not initialed by the Contractor will not be binding.

21.7 Project Meetings. Subcontractor is required to attend all progress meetings when requested by Contractor, Architect, or Owner. Absence of Subcontractor at Progress Meetings when attendance is requested shall be subject to a $100.00 fine.

21.8 Equipment / Scaffolding. At no time shall subcontractor or any forces employed by or acting for, by, through or under subcontractor use any equipment or scaffolding which is owned, rented, or maintained by Contractor without prior written consent of Contractor and signed Release of Liability Waiver.

21.9 All requirements of Specification Divisions 00 and 01 apply to Subcontractor.

Exhibit C

Waiver of Lien to Date Sample

STATE OF: _____ Pay Application #:_____

COUNTY OF: _____ Invoice No.:_____

TO WHOM IT MAY CONCERN:

WHEREAS the undersigned has been employed by Michael Kinder & Sons, Inc. to furnish labor, material and equipment for the project known XXX is the owner.

THE undersigned, for and in consideration of _____ and _____/100 ($_____) Dollars, and other good and valuable considerations, upon the receipt whereof will be acknowledged, will hereby waive and release any and all lien or claim of, or right to lien, under the statutes of the State of Indiana, relating to mechanics' liens, with respect to and on said above-described premises, and the improvements, thereon, and on the material, fixtures, apparatus or machinery furnished, and on the moneys, funds or other considerations due or to become due from the owner, on account of all labor, services, material, fixtures, apparatus or machinery, furnished to this date by the undersigned for the above-described premises, INCLUDING EXTRAS.*

DATE _____

COMPANY NAME _____

COMPANY ADDRESS _____

CITY, STATE, ZIP _____

BY: _____

TITLE: _____

*EXTRAS INCLUDE BUT ARE NOT LIMITED TO CHANGE ORDERS, BOTH ORAL AND WRITTEN TO THE CONTRACT.

Subcontractor's Affidavit Sample

STATE OF: _____ Pay Application #:_____
COUNTY OF: _____ Invoice No.:_____

TO WHOM IT MAY CONCERN:

That the total amount of the contract with Michael Kinder and Sons, Inc. including extras* is $_____ on which he or she has received payment of $_____ as of the notarized date below. That all waivers are true, correct and genuine and delivered unconditionally and that there is no claim either legal or equitable to defeat the validity of said waivers.

That for the purpose of said contract, the following persons, firms or corporations have been engaged to furnish, have furnished, or will furnish materials and/or labor for said project; that there are due or to become due to them respectively, the amounts set opposite their names for said materials and/or labor; that there are no other known commitments and there is nothing due or to become due to any person, firm, or corporation for labor, services, materials, fixtures, machinery, apparatus, supplies or services, other than as stated herein.

That there are no other contracts for said work outstanding, and that there is nothing due or to become due to any person for material, labor or other work of any kind done or to be done upon or in connection with said work other than below stated.

			(A)	(B)	(C)	A-B-C=
MATERIAL SUPPLIER OR SUBCONTRACTOR	PHONE NUMBER	PROVIDED	CONTRACT PRICE INCLDG EXTRAS*	PREVIOUSLY REQUESTED TO DATE	CURRENT PAYMENT DUE	BALANCE OWED
TOTAL LABOR AND MATERIAL INCLUDING EXTRAS* TO COMPLETE.						

DATE _____ COMPANY NAME: _____
BY: _____
TITLE: _____

I HERBY CERTIFY THAT THE PERSON NAMED ABOVE, APPREARED BEFORE ME THIS DAY IN PERSON AND ACKNOWLEDGED THEY SIGNED THIS DOCUMENT (INCLUDING SUPPLEMENTAL SHEETS ATTACHED HERETO) AS THEIR FREE AND VOLUNTARY ACT AND DEED FOR THE USES AND PURPOSES HEREIN STATED.

SUBSCRIBED AND SWORN TO BEFORE ME THIS _____ DAY OF _____

NOTARY PUBLIC _____

MY COMMISSION EXPIRES: _____

*EXTRAS INCLUDE BUT ARE NOT LIMITED TO CHANGE ORDERS, BOTH ORAL AND WRITTEN TO THE CONTRACT.

Subcontractor is required to provide sub-subcontractor and material supplier waivers for values exceeding $5,000.00

Sub-Subcontractor Waiver of Lien to Date Sample

STATE OF: _____ Pay Application #:_____
COUNTY OF: _____ Invoice No.:_____

TO WHOM IT MAY CONCERN:

WHEREAS the undersigned has been employed by _____ to furnish labor, material and equipment for the project known as Huhtamaki Restroom Renovation of which XXX is the owner.

THE undersigned, for and in consideration of _____ and _____/100 ($_____) Dollars, and other good and valuable considerations, upon the receipt whereof will be acknowledged, will waive and release any and all lien or claim of, or right to lien, under the statutes of the State of Indiana, relating to mechanics' liens, with respect to and on said above-described premises, and the improvements, thereon, and on the material, fixtures, apparatus or machinery furnished, and on the moneys, funds or other considerations due or to become due from the owner, on account of all labor, services, material, fixtures, apparatus or machinery, furnished to this date by the undersigned for the above-described premises, INCLUDING EXTRAS.*

DATE _____

COMPANY NAME _____
ADDRESS _____
CITY, STATE, ZIP _____
BY: _____
TITLE: _____

*EXTRAS INCLUDE BUT ARE NOT LIMITED TO CHANGE ORDERS, BOTH ORAL AND WRITTEN TO THE CONTRACT.

Sub-Subcontractor's Affidavit Sample

STATE OF: _____
COUNTY OF: _____

TO WHOM IT MAY CONCERN:

THE undersigned, (Name) _____ being duly sworn, deposes and says that he or she is (Position) _____ of (Company Name) _____ who is the contractor furnishing _____ on the building located at XXX, owned by XXX.

That the total amount of the contract including extras* is $_____ on which he or she has received payment of $_____ as of the notarized date below. That all waivers are true, correct and genuine and delivered unconditionally and that there is no claim either legal or equitable to defeat the validity of said waivers. That the following are the names and addresses of all parties who have furnished material or labor, or both, for said work and all parties having contracts or sub contracts for specific portions of said work or for material entering into the construction thereof and the amount due or to become due to each, and that the items mentioned include all labor and material required to complete said work according to plans and specifications.

That there are no other contracts for said work outstanding, and that there is nothing due or to become due to any person for material, labor or other work of any kind done or to be done upon or in connection with said work other than above stated.

DATE _____ SIGNATURE _____

SUBSCRIBED AND SWORN TO BEFORE ME THIS _____ DAY OF _____
NOTARY PUBLIC _____
MY COMMISSION EXPIRES: _____

Material Supplier Waiver of Lien to Date Sample

STATE OF: _____ Pay Application #:_____
COUNTY OF: _____ Invoice No.:_____

TO WHOM IT MAY CONCERN:

WHEREAS the undersigned has been employed by_____ to furnish material and/or equipment for the project known as XXX is the owner.

THE undersigned, for and in consideration of _____ and _____/100 ($_____) Dollars, and other good and valuable considerations, upon the receipt whereof will acknowledged, will waive and release any and all lien or claim of, or right to lien, under the statutes of the State of Indiana, relating to mechanics' liens, with respect to and on said above-described premises, and the improvements, thereon, and on the material, fixtures, apparatus or machinery furnished, and on the moneys, funds or other considerations due or to become due from the owner, on account of all labor, services, material, fixtures, apparatus or machinery, furnished to this date by the undersigned for the above-described premises, INCLUDING EXTRAS.*

DATE _____ COMPANY NAME _____
ADDRESS _____
CITY, STATE, ZIP _____
BY: _____
TITLE: _____

*EXTRAS INCLUDE BUT ARE NOT LIMITED TO CHANGE ORDERS, BOTH ORAL AND WRITTEN TO THE CONTRACT

Material Supplier Affidavit Sample

STATE OF: _____

TO WHOM IT MAY CONCERN:

THE undersigned, (Name) _____ being duly sworn, deposes and says that he or she is (Position) _____ of (Company Name) _____ who is the material supplier furnishing _____ for _____ (Company purchasing material) on the building located at XXX, owned by XXX.

That the total amount of the contract including extras* is $_____ on which he or she has received payment of $_____ as of the notarized date below. That all waivers are true, correct and genuine and delivered unconditionally and that there is no claim either legal or equitable to defeat the validity of said waivers. That the following are the names and addresses of all parties who have furnished material or labor, or both, for said work and all parties having contracts or sub contracts for specific portions of said work or for material entering into the construction thereof and the amount due or to become due to each, and that the items mentioned include all labor and material required to complete said work according to plans and specifications.
That there are no other contracts for said work outstanding, and that there is nothing due or to become due to any person for material, labor or other work of any kind done or to be done upon or in connection with said work other than above stated.

DATE _____ SIGNATURE _____

SUBSCRIBED AND SWORN TO BEFORE ME THIS _____ DAY OF _____
NOTARY PUBLIC _____
MY COMMISSION EXPIRES: _____

Exhibit D Insurance Compliance Checklist

The following sample Certificate of Insurance shows the requirements needed to meet the terms of the Contract Agreement with Michael Kinder & Sons, Inc.

Please submit your client's Certificate of Insurance electronically to our office.

Please be sure your certificate of insurance and coverage meet the following requirements:

1. General aggregate limit is on a per project basis.
2. Limits are equal to or greater than those required.
3. Installation floater is included.
4. Michael Kinder & Sons, Inc. and the project owner are protected as blanket additional insured on the General Liability Policy (per Form #CG7037 or equivalent) including ongoing operations and products/completed operations as required by contract.
5. Michael Kinder & Sons, Inc. and the project owner are protected as blanket additional insured on the Auto Liability Policy (per Form #CA2048 or equivalent).
6. All insurance is primary and non-contributory.
7. Waiver of Subrogation in favor of Michael Kinder & Sons, Inc. on the General Liability and Workers Compensation policies is included.

Should you have any questions, please contact the project manager at out office. (260) 744-4359

Thank you.

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 8/16/2018

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Account Manager Name
ISU Stewart, Brimner, Peters & Company 3702 Rupp Drive Fort Wayne IN 46815	PHONE (A/C, No, Ext): (260) 482-6900 FAX (A/C, No): (260) 482-7305 E-MAIL ADDRESS: Account Manager email address
INSURED	**INSURER(S) AFFORDING COVERAGE** / **NAIC #**
Full Named Insured Address City St Zip	INSURER A: Name of Insurance Company INSURER B: INSURER C: INSURER D: INSURER E: INSURER F:

COVERAGES **CERTIFICATE NUMBER:** 17/18 Sample **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: POLICY X PRO-JECT LOC OTHER:	X	Y	123456789	XX/XX/XXXX	XX/XX/XXXX	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 100,000 $ 5,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
A	AUTOMOBILE LIABILITY X ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS X HIRED AUTOS X NON-OWNED AUTOS	X	Y	123456789	XX/XX/XXXX	XX/XX/XXXX	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident) Underinsured motorist	$ 1,000,000 $ $ $ $ 1,000,000
A	X UMBRELLA LIAB X OCCUR EXCESS LIAB CLAIMS-MADE DED RETENTION $			123456789	XX/XX/XXXX	XX/XX/XXXX	EACH OCCURRENCE AGGREGATE	$ 5,000,000 $ 5,000,000
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N N (Mandatory in NH) N / A If yes, describe under DESCRIPTION OF OPERATIONS below	N / A	Y	123456789	XX/XX/XXXX	XX/XX/XXXX	X PER STATUTE OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 500,000 $ 500,000 $ 500,000
A	Installation Floater			123456789	XX/XX/XXXX	XX/XX/XXXX	Limit Deductible	$500,000 $500

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Michael Kinder & Sons, Inc., & their affiliates, directors, employees, subsidaries, representative & any other parties as required by the GC/SubContractor contract agreement are listed as certificate holders. Per the signed contract, contractor & owner must be protected as blkt addl insureds on the GL policy incl on-going operations & prod/completed operations (Form #CG7037 or equivalent), & on the Auto Liab policy (Form CA2048 or equivalent). All insurance for subcontractors/sub-subcontractors shall be Primary & Non-Contributory. A Waiver of Subro clause in favor of Michael Kinder & Sons, Inc. shall be added to the GL, Auto and Work Comp Policies. Umbrella follows form.

CERTIFICATE HOLDER	CANCELLATION
wboyer@kinderandsons.com Michael Kinder & Sons, Inc. 5206 Decatur Road Fort Wayne, IN 46806	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE Jeff Peters/AJP

SECTION 01 22 00 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Requirements:

1. Section 01 21 00 "Allowances" for procedures for using unit prices to adjust quantity allowances.

1.2 DEFINITIONS

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

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included with the bid form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on Bid Form for certain work defined in Bidding Requirements that may be added to or deducted from Base Bid amount if Owner decides to accept a corresponding change either in quantity of construction to be completed or in products, materials, equipment, systems, or installation methods described in Contract Documents.
   1. The cost or credit for each alternate is net addition to or deduction from Contract Sum to incorporate alternate into Work. No other adjustments are made to Contract Sum.
   2. Alternates described in this Section are part of Work only if enumerated in Agreement.

1.3 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of 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. Notification: Immediately following award of Contract, notify each entity involved, in writing, of status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under same conditions as other work of Contract.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Remove and replace subsiding straightaway area indicated on Drawings. This includes adding aggregate base course to existing base, new asphalt base course, and new asphalt surface course.

   Base Bid shall include the new 1/2 inch polyurethane track system over the straightaway areas and existing track extents.

B. Alternate No. 2: Provide new 6 inch thick concrete slab on grade, spectator pad, as indicated on Drawing Sheets G1.00 and G4.00.

C. Alternate No. 3: Provide enlarged School Logo, Eagle Head and text, within turf area as indicated on Drawing Sheet G1.00.

D. Alternate No. 4: Provide credit for not providing performance and payment bond.

END OF SECTION 01 23 00

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Submittal schedule requirements.
   2. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require A/E's and Construction Manager'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 A/E's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Information submittals are those submittals indicated in individual specification sections as “Quality Assurance/Control Submittals” or “Informational Submittals.”

C. Closeout Submittals: Written and graphic information and physical extra stock items required at or near completion of a project. Requirements for those submittals are included in the General Conditions of the contract and Division 01 Section “Closeout Procedures”.

D. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

E. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 SUBMITTAL SCHEDULE

A. A list of required submittals will be provided to the Contractor by the Construction Manager, for use as a checklist, at the Pre-Construction Meeting. Color and Material sample submittals are required within 45 days of the Pre-Construction Meeting. All submittals are required are to be completed within 120 days of the Pre-Construction Meeting or within a shorter, more immediate timeframe as required by the Project Schedule.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. A/E's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings may be provided by A/E for Contractor's use in preparing submittals.
   1. The cost to obtain Drawing files shall be as indicated on the “Digital Data Transmittal”.
   2. Contractor shall send a “Digital Data Transmittal” to A/E to request digital data files.
      a. Digital Data Transmittal is included hereinafter.
   3. Allow 14 days for processing Digital Data request.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Where submission of samples, shop drawings, or other items are required from suppliers or subcontractors, it shall be the responsibility of the Contractor for whom the subcontractor is executing the Work to see that the submittal items required are complete and properly submitted, and corrected and resubmitted at the time and in the order required so as not to delay the progress of the Work. Submittals shall include sufficient detail to determine that the contractor clearly understands the requirements of the Contract Documents.
    b. Contractors on this Project shall provide submittals in accordance with the requirements of this Section. Where a submittal is required by a Contractor but assistance needed from others, Contractors shall participate and cooperate to expedite each submittal. .
    c. A/E and Construction Manager reserve 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 A/E's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
    1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
    2. Resubmittal Review: Allow 14 days for review of each resubmittal.
    3. Submittals Not Required: A/E will send a transmittal indicating submittals were “not required for review”. All copies of the submittals may be disposed of by the A/E.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
    1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
    2. Each submittal shall be transmitted separately and shall cover only one specification section.
    3. Name file with submittal number or other unique identifier, including revision identifier.
        a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
    4. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by A/E and Construction Manager.

E. Options: Identify options requiring selection by the A/E.

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

G. 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 A/E's and Construction Manager's action stamp.

H. 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.
   1. Final Shop Drawings: Furnish one full-size copy (as marked) to be kept at the Project site.

I. Use for Construction: Use only final submittals that are marked “No Exceptions Taken” or “Note Markings” from A/E's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES, GENERAL

A. Submittals, including those specified herein to be submitted to the Architect, shall be submitted directly to the Construction Manager for review. The Construction Manager will forward required submittals to the Architect for review.

B. General Submittal Procedure Requirements: All submittals are to be submitted electronically.
   1. The Contractor shall limit each electronic submittal to a single Specification Section. Compile all sheets of each submittal into a single non-changeable electronic PDF file format.
   2. Electronic files can be received in format size up to 30 inches by 42 inches. Electronic CAD files are also acceptable. Submittals in a different manner or format will require prior approval from the Construction Manager.
   3. Each electronic submittal transmittal shall include the following information:
      a. Date submitted.
      b. Project title, Construction Manager number and A/E Project Number.
      c. Contractor’s name and address.
      d. Identification by Specification Section and quantity submitted for each submittal including name of subcontractors, manufacturer or supplier.
      e. Notification of deviations from the Contract Documents for each submittal.

C. The Contractor shall check each submittal and note their approval, comments or suggestion on the submittal.
   1. Contractor’s written approval or stamp must be marked on each submittal or it will be returned without action.
   2. Contractor shall identify any options requiring selection by A/E.

D. A/E, through the Construction Manager, will return annotated files electronically.
   1. Comments will consist of annotations applied electronically to the file or transmittal form.

E. Resubmittals: Make resubmittals in same form 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 A/E's and Construction Manager's action stamp.

F. Electronic submittals will only be accepted in an unchangeable electronic format such as pdf. File formats such as MS Word (.doc or .docx), MS Excel (.xls or xlsx), AutoDesk, AutoCAD (.dwg or .dwf), are considered unacceptable as the original file submitted could be accidentally altered from the originators intended document. These file types will be rejected by A/E.

2.2 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual specification sections.

B. Product Data: Collect information into a single submittal for each element of construction or system. Product data includes printed information, such as manufacturer’s installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Product data unmarked by Contractor may be returned unreviewed by A/E. Include the following information, as applicable:
    a. Manufacturer's product specifications
    b. Manufacturer's installation instructions
    c. Standard color charts
    d. Manufacturer's catalog cuts
    e. Compliance with specified trade association standards.
    f. Compliance with recognized testing agency standards.
    g. Application of testing agency labels and seals.
    h. Notation of dimensions verified by field measurement.
    i. Notation of coordination requirements.
    j. Availability and delivery time information.
2. For equipment, include the following in addition to the above, as applicable.
    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying shop drawings.
3. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed. Submit before or concurrent with samples and Shop Drawings.
    a. Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options is required.
4. If a product changes or a name change has occurred an accompanying letter of explanation with the submittal is in order.
5. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
    a. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
    b. Do not permit use of unsubmitted copies of Product Data in connection with construction.
6. In compliance with the OSHA Hazard Communication Standard (1910.1200, 08-24-1987) Contractors shall post at the site MSDS (Material Safety Data Sheets) for ALL products classified as hazardous that their firm has knowledge that they will be furnishing, using, or storing on the jobsite during the duration of this Project in accordance with OSHA standards. At the completion of the project, the Contractor shall turn their "MSDS" information directly over to the Owner with a receipt for the Owner to sign. A copy of the signed receipt only shall be submitted to the A/E.
    a. Material Safety Data Sheets (MSDS) should not be submitted to the A/E for review. Material Safety Data Sheets submitted to A/E will removed or cross out with no action taken.
7. Submit product data in the following format:
    a. PDF electronic file.

C. Shop Drawings: Prepare project specific information, drawn accurately to scale. Do not base shop drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on A/E's digital data drawing files is otherwise permitted.
1. The Contractor shall perform no portion of the Work requiring submittal and review of shop drawings, product data, samples or similar submittals until the A/E has approved the respective submittal. Such Work shall be in accordance with approved submittals.
2. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the bases of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

3. Shop drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data that are prepared by the Contractor or subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work. Shop drawings are to be specially prepared for a specific Product to show how a given item is to be fabricated and installed; this is what distinguishes shop drawings from product data. Shop drawing show how the Contractor intends to fulfill contractual obligations and reflect the Contractor's understanding of the information given in the Contract Documents. Contract Documents do not show every condition that may exist, and they do not fully indicate how every part and piece must be fabricated or incorporated into the Construction. Preparing accurate Shop Drawings provides the opportunity to fully detail all conditions and show how requirements will be satisfied. Do not base shop drawings on reproduction of the Contract Documents.
    a. Advertising brochures will not be accepted as shop drawings.
    b. Erection and setting drawings as referred to in these Specifications will be considered as shop drawings and shall be submitted along with detailed shop drawings.
    c. Where schedules are required to indicate locations, they shall be submitted as part of the shop drawings package for that item.
    d. Shop drawings and schedules shall repeat the identification shown on the Contract Drawings.
    e. The Contractor shall check all shop drawings, samples and other submittals and submit them to the A/E utilizing a Transmittal Form, giving his approval and/or comments and suggestions. Failure to use a Transmittal Form will result in submittals being returned "without action".
    f. Include the following information:
        1) Dimensions
        2) Identification of products and materials included by sheet and detail number
        3) Compliance with specified standards
        4) Notation of coordination requirements
        5) Notation of dimensions established by field measurements
        6) Fabrication and installation drawings
        7) Roughing-in and setting diagrams
        8) Wiring diagrams showing field installed wiring, including power, signal, and control wiring
        9) Shop work manufacturing instructions
        10) Templates and patterns
        11) Schedules
        12) Design calculations
        13) Seal and signature of professional engineer, if specified.
        14) Relationship and attachment to adjoining construction clearly indicated.
4. Preparation of Submittals: Provide permanent marking on each submittal to identify project, date, Contractor, Subcontractor, submittal name, and similar information to distinguish it from other submittals. Show Contractor's executed review and approval marking and provide space for A/E's "action" marking. Package each submittal appropriately for transmittal and handling.
5. By approving and submitting shop drawings, the Contractor thereby represents that he has determined and verified field measurements, field construction criteria, materials, catalog numbers, and similar data, and that he has checked and coordinated each shop drawing with the requirements of the Work and of the Contract Documents prior to submitting to the A/E.
6. The Contractor shall make corrections required by the A/E and shall resubmit shop drawings until appropriately marked. The Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than the corrections requested by the A/E on previous submissions.
7. The A/E will review shop drawings only for conformance with the design concept of the Project and with the information given in the Contract Documents. The A/E's review of a separate item shall not indicate review of an assembly in which the item functions.

8. The A/E's review of shop drawings shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the A/E in writing of such deviation at the time of submission and the A/E has given written approval to the specific deviation, nor shall the A/E's action relieve the Contractor from responsibility for errors or omissions in the shop drawings.
    a. The A/E's review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and qualities, or for substantiating instructions or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The A/E's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the A/E, of any construction means, methods, techniques, sequences, or procedures. The A/Es approval of a specific item shall not indicate approval of an assembly of which it is a component.
9. Notations and remarks added to shop drawings by the A/E are to ensure compliance to Drawings and Specifications and do not imply a requested or approved change to contract cost.
10. Should deviations, discrepancies, or conflicts between shop and contract drawings and Specifications be discovered, either prior to or after review, Contract Documents shall control and be followed.
11. Submit shop drawings in the following format:
    a. PDF electronic file.
12. Shop drawings not requested by the A/E shall be returned without action.

D. Samples for Initial Selection: Prepare physical units of materials or products, including the following:
1. The Contractor shall submit to the A/E samples to illustrate materials or workmanship, colors, and textures, and establish standards by which the Work will be judged.
    a. Transmit samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of samples that includes the following:
    a. Generic description of sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable specification section.
    e. Specification paragraph number and generic name of each item.
3. Email Transmittal: Provide corresponding electronic submittal of sample transmittal, digital image file illustrating sample characteristics, and identification information for record.
4. Samples for Initial Selection: Submit manufacturer's color published charts consisting of units or sections of units showing the full range of colors, textures, and patterns available. Reproductions, facsimiles, or copies will be rejected.
    a. Number of Samples for Initial Selection: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. A/E will return one submittal with options selected.

E. Samples for Verification: Submit full size, fully fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
1. Number of Samples for Verification: Submit 2 sets of samples. A/E will retain sample sets, unless otherwise noted.
    a. Contractor shall receive written notification.
2. Email Transmittal: Provide corresponding electronic submittal of sample transmittal, digital image file illustrating sample characteristics, and identification information for record.
3. Disposition: Maintain sets of approved samples at project site, available for quality control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Identification: Permanently attach label on unexposed side of Samples that include the following:
   a. Product name and submittal number.
   b. Generic description of the 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.
5. Submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
   a. Where variation in color, pattern, texture, and other characteristic is inherent in the material or product represented, submit at least3 multiple units that show approximate limits of the variations.
   b. Refer to other Specification Sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
6. By approving and submitting samples, the Contractor thereby represents that he has determined and verified materials, catalog numbers, and similar data, and that he has checked and coordinated each sample with the requirements of the Work and of the Contract Documents prior to submitting to the A/E.
7. The Contractor shall resubmit the required number of correct or new samples until approved. The Contractor shall direct specific attention in writing or on resubmitted samples to revisions other than the changes requested by the A/E on previous submissions.
8. The A/E will review samples but only for conformance with the design concept of the Project and with the information given in the Contract Documents. The A/E's review of a separate item shall not indicate approval of an assembly in which the item functions.
9. The A/E's action shall not relieve the Contractor of responsibility for deviations from the requirements of the Contract Documents unless the Contractor has informed the A/E in writing of the deviation at the time of submission and the A/E has given written approval to the specific deviation, nor shall the A/E's action relieve the Contractor from responsibility for errors or omissions in the samples.
10. Unless otherwise specified, samples shall be in duplicate and of adequate size to show function, equality, type, color, range, finish, and texture of material. When requested full technical information and certified test data shall be supplied.
    a. Each sample shall be labeled, bearing material name and quality, the Contractor's name, date, project name, and other pertinent data.
    b. Transportation charges to and from the A/E's office must be prepaid on samples forwarded. The A/E shall retain samples until the Work for which they were submitted has been accepted.
11. Materials shall not be ordered until final review is received in writing from the A/E. Materials shall be furnished, equal in every respect to reviewed samples. Where color or shade cannot be guaranteed, the manufacturer shall indicate the maximum deviation. Work shall be in accordance with the final reviewed samples.

2.3 INFORMATIONAL/QUALITY ASSURANCE/CONTROL SUBMITTALS

A. General: Prepare and submit informational submittals required by other Specification Sections.

B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of A/Es and Owners, and other information specified.

C. 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.
   2. Manufacturer and product name, and model number if applicable.
   3. Number and name of room or space.
   4. Location within room or space.
   5. Submit product schedule in the following format:
      a. PDF electronic file.

D. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumption and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

E. Certificates:
   1. Certificates and Certification 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: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized for this specific project.
   3. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
   4. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
   5. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
   6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Test and Research Reports:
   1. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
   2. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, 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.
   3. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
   4. Preconstruction Test Reports: Prepare 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.
   5. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. 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.
      a. Test reports shall be no older than 15 months, unless otherwise noted or approved by A/E.
   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.

G. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 01 Section “Closeout Procedures”.

H. Manufacturer’s Instructions: Prepare written or published information that documents manufacturer’s recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates
2. Required substrate tolerances
3. Sequence of installation or erection
4. Required installation tolerances
5. Required adjustments
6. Recommendations for cleaning and protection

I. Manufacturer’s Field Reports: Prepare written information documenting factory authorized service representative’s tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

J. Material Safety Data Sheets (MSDSs) or Safety Data Sheet(s): Submit information directly to Owner; do not submit to A/E. MSDS are to be collected and field as the jobsite by the Contractor as required by OSHA and other authorities. They communicate, to the Contractor’s employees and other persons authorized to be on the Project site, important information about hazardous materials, such as their chemical and common names; ingredients that have been determined to be health hazards or carcinogens; physical and chemical characteristics; ingredients that have been determined to be physical hazards (potential for fire, explosion, reactivity, and so forth); health hazards, including signs and symptoms of exposures; and the OSHA – permissible exposure limit. Also included are precautions for their safe handling and use along with emergency and first-aid procedures to follow in case of exposure.
1. This information relates directly to construction safety, which is the sole responsibility of the Contractor.
2. MSDS or SDS shall not be submitted to the A/E for review.
3. MSDS or SDS submitted to A/E will be either removed or crossed out of submittal with no action taken.

K. Coordination Drawings: Comply with requirements specified in Division 1 Section “Project Management and Coordination”.

L. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

M. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

2.4 CLOSEOUT SUBMITTALS

A. General: Closeout Submittals are to be submitted with O and M Manuals only. Do not submit with other ACTION and INFORMATIONAL Submittals.
   1. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 01 Section “Closeout Procedures”.

2.5 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to A/E.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally-signed PDF electronic file signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational/Quality Assurance/Control 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 A/E and Construction Manager.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."

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

3.2 A/E'S AND CONSTRUCTION MANAGER'S ACTION

A. General: A/E and Construction Manager will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: A/E and Construction Manager will review each submittal, make marks to indicate corrections or modifications required, and return it. A/E will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
   1. Shop drawings will be marked as follows: Contractor shall take the following action for each respective marking:
      a. "NO EXCEPTIONS TAKEN" – Contractor shall make and distribute copies.
      b. “NOTE MARKINGS” – Final Release; Contractor may proceed with fabrication, taking into account the necessary corrections on submittal or attached and with Contract Documents.
      c. "NOTE MARKINGS/RESUBMIT" - Contractor may proceed with fabrication, taking into account the necessary corrections. Corrected shop drawings shall be resubmitted before fabrication of this work is complete to obtain a different action marking. Do not allow drawings marked "Resubmit" to be used in connection with installation of the Work.

d. "REJECTED" - Contractor will be required to resubmit shop drawings in their entirety. No fabrication or installation shall be started until shop drawings so marked have been completely revised, resubmitted, and marked by A/E according to preceding Paragraphs a., b., or c.

C. Informational/Quality Assurance/Control Submittals: A/E and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from A/E and Construction Manager.

E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 33 00

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-assurance and -control services required by A/E, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:
   1. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

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

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

C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
   1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on the project site, consisting of multiple products, assemblies and subassemblies.
   2. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

D. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

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

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

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

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

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

1.3 CONFLICTING REQUIREMENTS

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

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to A/E for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. 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.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

1.5 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

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

1.6 QUALITY ASSURANCE

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

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

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

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

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

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

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

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

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

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by A/E.
   2. Notify A/E and Construction Manager seven days in advance of dates and times when mockups will be constructed.
   3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
   4. Demonstrate the proposed range of aesthetic effects and workmanship.
   5. Obtain A/E's approval of mockups before starting work, fabrication, or construction.
      a. Allow seven days for initial review and each re-review of each mockup.
   6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   7. Demolish and remove mockups when directed, unless otherwise indicated.

K. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual specification sections, along with supporting materials.

L. Room Mockups: Construct room mockups incorporating required materials and assemblies, finished in accordance with requirements. Provide required lighting and additional lighting where required to enable A/E to evaluate quality of the Work. Provide room mockups of the following rooms:

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

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

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

F. Testing Agency Responsibilities: Cooperate with A/E, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify A/E, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.

6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses. .
1. Distribution: Distribute schedule to Owner, A/E, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector 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 A/E, Construction Manager, 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 A/E, through Construction Manager, 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. 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 A/E.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for A/E's and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. 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; product substitutions; and comparable products.
   1. It is the intent of the Specifications and Drawings to accomplish a complete and first-rate installation executed by competent and experienced workers.
   2. Equipment, specialties, and similar items shall be checked for compliance and approved prior to installation. Contractors are cautioned that work or equipment installed without approval is subject to condemnation, removal, and subsequent replacement with an approved item without extra remuneration.

B. Related Sections include the following:
   1. Divisions 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

A. Products: Items purchased 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, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is 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: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
   1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
   2. If a dispute arises between contractors over concurrently selectable but incompatible products, A/E will determine which products shall be used.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. 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 ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:
   1. Store products to allow for inspection and measurement of quantity or counting of units.
   2. Store materials in a manner that will not endanger Project structure.
   3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Store cementitious products and materials on elevated platforms.
   5. Store 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.

D. Each Contractor shall be responsible for materials he orders for delivery to the jobsite. Responsibility includes, but is not limited to, receiving, unloading, storing, protecting, and setting in place; ready for final connections.
   1. The Owner will not be responsible for deliveries related to the construction or operation of the Contractor. The Owner cannot sign delivery forms for the Contractor.

E. Contractors shall insure that products are delivered to the Project in accordance with the Construction Schedule of the Project. In determining date of delivery, sufficient time shall be allowed for shop drawings and sample approvals, including the possibility of having to resubmit improperly prepared submittals or products other than those specified and the necessary fabrication or procurement time along with the delivery method and distance involved.

1.5 WARRANTIES

A. Specific warranties or bonds called for in the Contract Documents, in addition to that falling under the general warranty as set forth in General Conditions, shall be furnished in accordance with the requirements of the Specifications.
   1. Owner’s Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
      a. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

B. Each Contractor shall and does hereby agree to warrant for a period of one year, or for longer periods, where so provided in the Specifications, as evidenced by the date of Substantial Completion issued by the A/E, products installed under the Contract to be of good quality in every respect and to remain so for periods described herein.

C. Should defects develop in the previously mentioned Work within the specified periods, due to faults in products or their workmanship, the Contractor hereby agrees to make repairs and do necessary Work to correct defective Work to the A/E's satisfaction, in accordance with the General and Supplementary Conditions. Such repairs and corrective Work, including costs of making good other Work damaged by or otherwise affected by making repairs or corrective Work, shall be done without cost to the Owner and at the entire cost and expense of the Contractor within 30 days after written notice to the Contractor by the Owner.

1. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
2. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

D. Nothing herein intends or implies that the warranty shall apply to Work that has been abused, neglected, or improperly maintained by the Owner or his successor in interest.

E. Where service on products is required under this Article, it shall be promptly provided when notified by the Owner and no additional charge shall be made, unless it can be established that the defect or malfunctioning was caused by abuse or accidental damage not to be expected under conditions of ordinary wear and tear.

F. In the event movement in the adjoining structure or components causes malfunctioning, the Contractor responsible for the original installation of the adjoining structure or components shall provide such repair, replacement, or correction necessary to provide for proper functioning to bring the equipment back into the same operating condition as approved at the completion of the building.

G. The manufacturer and supplier expressly warrants that each item of equipment furnished by him and installed in this Project is suitable for the application shown and specified in the Contract Documents and includes features, accessories, and performing characteristics listed in the manufacturer's catalog in force on the date bids are requested for the Work. This warranty is intended as an assurance by the manufacturer that his equipment is not being misapplied and is fit and sufficient for the service intended. This warranty is in addition to and not in limitation of other warranties or remedies required by law or by the Contract Documents. It shall be the responsibility of the Contractor for the particular equipment to obtain this warranty in writing.

H. In case the Contractor fails to do Work so ordered, the Owner may have Work done and charge the cost thereof against monies retained as provided for in the Agreement and, if said retained monies shall be insufficient to pay such cost or if no money is available, the Contractor and his Sureties shall agree to pay to the Owner the cost of such Work.

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

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

J. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," A/E will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is A/E's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:
1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
   a. Restricted List: Where specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Substitutions for Contractor’s convenience will not be considered after award, unless otherwise noted.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
   a. Restricted List: Where specifications include a list of manufacturer’s names, provide a product by one of the manufacturers listed that complies with requirements. Substitutions for Contractor’s convenience will not be considered, unless otherwise indicated.
5. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. .
6. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches A/E's sample. A/E's decision will be final on whether a proposed product matches.
   a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 Article "Product Substitutions" for proposal of product.
7. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, and textures" or a similar phrase, select a product that complies with other specified requirements.
   a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, A/E will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
   b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, A/E will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PROTECTION

A. Contractor shall protect building elements and products subject to damage. Should workers or other persons employed or commissioned by a Contractor be responsible for damage, the entire cost of repairing said damage shall be assumed by that individual Contractor. Should damage be done by a person or persons not employed or commissioned by a Contractor, the respective Contractors shall make repairs and charge the cost to the guilty person or persons. The affected Contractors shall be responsible for collecting such charges. If the person or persons responsible for damage cannot be discovered, the respective Contractor shall make full and satisfactory repairs, and the cost of Work shall be prorated against each Contractor.

B. The respective Contractors shall protect their products prior to installation and final acceptance. Storage shall be dry, clean, and safe. Materials or equipment damaged, deteriorated, rusted, or defaced due to improper storage shall be repaired, refinished, or replaced, as required by the A/E. Products lost through theft or mishandling shall be replaced by the Contractor without cost to the Owner.

2.3 ACCEPTANCE OF EQUIPMENT OR SYSTEMS

A. The Owner will not accept the start of the warranty period on systems or equipment until Substantial Completion is issued to the respective Contractor(s) for Owner's occupancy of the building, in part or whole. Each Contractor shall make such provisions as required to extend the manufacturer's warranty from time of initial operation of systems or equipment until Substantial Completion is given in writing.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:
   1. Division 02 Section "Selective Structure Demolition" for demolition of selected portions of the building.
   2. Divisions 2 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
   3. Division 07 Section "Penetration Firestopping" for patching fire-rated construction.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

C. Cutting and patching performed during the manufacture of products or during the initial fabrication, erection, or installation processes is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching".

1.3 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
   1. Structural Elements: When cutting and patching structural elements, notify A/E of locations and details of cutting and await directions from the A/E before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
      a. Foundation construction.
      b. Bearing and retaining walls.
      c. Structural concrete.
      d. Structural steel.
      e. Lintels.
      f. Structural decking.
      g. Miscellaneous structural metals.
      h. Exterior curtainwall construction.
      i. Equipment supports.
      j. Piping, ductwork, vessels, and equipment.
      k. Structural systems of special construction in Division 13 Sections.

B. 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. Operating elements include the following:
   1. Primary operational systems and equipment.
   2. Air or smoke barriers.
   3. Fire-suppression systems.
   4. Mechanical systems piping and ducts.
   5. Control systems.
   6. Communication systems.
   7. Conveying systems.
   8. Electrical wiring systems.

9. Operating systems of special construction in Division 13 Sections.
10. Fire detection and alarm systems.
11. Fire separation assemblies.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related 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. Miscellaneous elements include the following:
1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain-wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise- and vibration-control elements and systems.
7. Sprayed fire-resistive material.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in A/E's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

F. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

C. Cast-In-Place Concrete
1. Cementitious Materials
a. Portland Cement: ASTM C150, Type I or III, grey.
b. Normal-Weight Aggregate: ASTM C33, Class 3S.
2. Mix
a. Minimum Compressive Strength: 3500 psi at 28 days.
b. Maximum Water-Cementitious Materials Ratio: 0.45.
c. Slump Limit: 4 inches, plus or minus 1 inch, before adding water-reducing or plasticizing admixtures, with maximum slump less than 6 inches.
1) High range water reducers are not allowed.
d. Air Content: Do not allow air content of troweled finish floors to exceed 3 percent.

D. Hydraulic Cement Repair Underlayment: Cement-based, polymer-modified self-leveling product that can be applied in thicknesses required to patch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C150, 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.
    a. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.
4. Compressive Strength: Not less than 4,000 psi at 28 days when tested according to ASTM C 109.
5. Products: Subject to compliance with requirements, provide one of the following:
    a. Ardex, Inc.; Ardex k-15
    b. BASF; Enemrex Self-Leveling Underlayment of MBT Mastertop 110 Plus Underlayments.
    c. Dayton Superior Corp.; Levelayer
    d. Dependable Chemical Co.; Skimflow ES
    e. Euclid Chemical Company; Super Flo-Top
    f. MAPEI Corp.; Ultrapan 1 Plus
    g. Maxxon Corp.; Level-Right
    h. TEC Specialty Products; EZ Level

E. Masonry Materials
1. Concrete Masonry Units: ASTM C90, normal weight, unless otherwise noted.
2. Mortar Material: Comply with ASTM C270, property specification.
    a. Portland Cement: ASTM C150, Type I or Type II.
    b. Hydrated Lime: ASTM C207, Type S.
    c. Aggregate for Mortar: ASTM C144.
    d. Use Type N mortar, unless otherwise noted.

F. Plaster Material
1. Metal Lath
    a. Expanded-Metal Lath: ASTM C 847 with ASTM A 653, G60, hot-dip galvanized zinc coating.
        1) Flat rib lath; weight: 3/4 lb/sq.yd.
    b. Wire-Fabric Lath
        1) Welded-wire lath; ASTM C923; self furring; weight: 1.4 lb/sq.yd.
        2) Woven-wire lath; ASTM C1032; self-furring, with stiffener wire backing; weight: 1.4 lb/sq.yd.
2. Accessories: Comply with ASTM C1063 and coordinate depth of trim and accessories with thicknesses to match existing.
3. Plaster Materials
    a. Portland Cement: ASTM C150, Type I.
    b. Lime: ASTM C206, Type S; or ASTM C207, Type S.
4. Plaster Mix: Comply with ASTM C926 and as required to match existing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. 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.

B. Temporary Support: Provide temporary support of Work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Division 01 Section "Summary."

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 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.
   2. Do not use cutting torches.
   3. Contractor shall make arrangements with the other trades for fitting his Work into the construction. Where the Contractor was given sufficient information as to required openings prior to construction and then the cost for cutting and restoring shall be paid for by the Contractor failing to provide the required openings.
   4. Contractor shall be responsible for cutting, fitting, and patching that may be required to complete his Work. Contractors shall not endanger Work of other Contractors by cutting, excavating, or otherwise altering Work; and shall not cut or alter the Work of other Contractors except with written consent of the A/E. Costs caused by defective or ill-timed Work shall be borne by the party responsible.
   5. Cutting or restoring performed by Contractors which is condemned by the A/E shall have such correction or restoration work performed through the General Contractor when so instructed by the A/E. The cost of such Work shall be borne by the Contractor responsible for the originally defective Work.
   6. No Contractor shall not do cutting that may impair the strength of the building or its components. No holes except for small screws or bolts may be drilled in the beams or other structural members for the purpose of supporting, routing, or attaching Work without obtaining prior approval from the A/E.
      a. Provide temporary support of work to be cut.
   7. Contractor shall do his own cutting and patching work in the existing building. This shall include cutting and patching required installing new utilities on the Project site.
   8. Refer to other Sections of these Specifications for specific cutting and patching requirements and limitations applicable to individual units of Work.
   9. Unless otherwise specified, requirements of this Section apply to Mechanical and Electrical Work.
      a. 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 prevent interruption to occupied areas.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
      a. After coring, Contractor shall pack and grout openings around sleeves or work penetrating the floor or deck.

b. CMU Removal: Remove units that are damaged or require removal to accommodate new work. Carefully remove entire units joint to joint, without damaging surrounding masonry in a manner that permits replacement with full size units.
    1) Support and protect remaining masonry that surrounds removal area. Maintain reinforcement and adjoining construction in an undamaged condition.
    2) Clean surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

4. Excavating and Backfilling: Comply with requirements in applicable Division 31 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. Do not proceed with patching until after construction operations requiring cutting in immediate area are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Patching should occur with materials and finishes to match the existing surrounding construction.
2. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
3. 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.
4. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
    b. Patch Floor: Mix and apply underlayment components according to manufacturer's written instructions.
        1) Close areas to traffic during underlayment and for time period after application recommended in writing by manufacturer.
        2) Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
        3) At substrate expansion, isolation, and other moving joints, allow joint of same width to continue underlayment.
        4) Apply primer over prepared substrate at manufacturer's recommended spreading rate.
        5) Apply underlayment to a uniform, level surface.
            a) Apply a final layer without aggregate to produce surface.
            b) Feather edges to match adjacent floor elevations.
        6) Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
        7) Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
        8) Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

c. Patch CMU: Replace damaged or removed units into bonding and coursing pattern of existing. Lay replacement units with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place.

5. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
   a. Cut, patch, and repair plaster as necessary to accommodate new work and to restore to match adjacent undisturbed surfaces. Repair or replace work to eliminate evidence of new work.
6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

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

END OF SECTION 01 73 29

DIVISION 10 SPECIALTIES

SECTION 107500 - FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes new ground-set flagpoles made from aluminum.

B. Related Sections include the following:
   1. Division 03 Section "Cast-in-Place Concrete" for concrete footings for flagpoles.
   2. Division 07 Section "Joint Sealants" for elastomeric sealant filling the top of the foundation tube.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide flagpole assemblies, including anchorages and supports, capable of withstanding the effects of wind loads, determined according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles."
   1. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.
   2. Basic Wind Speed: 90 mph; 3-second gust speed at 33 feet aboveground, unless otherwise noted as a greater wind speed.

1.4 SUBMITTALS

A. Quality Assurance/Control Submittals:
   1. Product Data: For each type of flagpole required.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flagpole as a complete unit, including fittings, accessories, bases, and anchorage devices, from a single manufacturer.
   1. Obtain flagpoles through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Postal Products Unlimited Inc. Company (Basis of design)
   2. American Flagpole; a Kearney-National Inc. Company.
   3. Baartol Company Inc. (The)
   4. Concord Industries, Inc.
   5. Eder Flag Manufacturing Company, Inc.
   6. Ewing International.
   7. Lingo Inc.; Acme Flagpole Division.
   8. Michigan Flagpole Inc.
   9. Morgan-Francis Div.; Original Tractor Cab Co., Inc.

10. PLP Composite Technologies, Inc.
11. Pole-Tech Company Inc.
12. Interstate Pole Industries
13. Adams Flagpole, Div. of Morgan Products

B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product. The “Substitution Request Form” and complete technical data for evaluation must accompany requests for A/E’s approval. All materials for evaluation must be received by the Project Manager and Specification Department at least 10 days prior to bid due date. Additional approved manufacturers will be issued by Addendum.

2.2 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. For tapered flagpoles, provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

B. Exposed Height: 35 and 60 feet - see plan for more information.

C. Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241, Alloy 6063, with a minimum wall thickness of 3/16 inch. Heat treat after fabrication to comply with ASTM B 597, Temper T6.

D. Foundation Tube: Galvanized corrugated-steel foundation tube, 0.064-inch- minimum nominal wall thickness. Provide with 3/16-inch steel bottom plate and support plate; 3/4-inch- diameter, steel ground spike; and steel centering wedges all welded together. Galvanize steel parts, including foundation tube, after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.
1. Provide flashing collar of same material and finish as flagpole.
2. Overall length of embedded ground-set poles to be provided setting depth of not less than 10 percent of exposed length.

2.3 FITTINGS

A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
1. 0.063-inch spun aluminum, finished to match flagpole.

B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

C. Halyard Flag Snaps: Provide two stainless-steel or nylon swivel snap hooks per halyard.
1. Provide with neoprene or vinyl covers.

2.4 MISCELLANEOUS MATERIALS

A. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi.

B. Concrete: Provide concrete composed of Portland cement, coarse and fine aggregate, and water mixed in proportions to attain a 28-day compressive strength of not less than 3000 psi, complying with ASTM C 94/C 94M.

C. Elastomeric Joint Sealant: Single-component neutral-curing silicone joint sealant complying with requirements in Division 07 Section "Joint Sealants" for Use NT (non-traffic) and for Use M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

2.5 FINISHES

A. Metal Finishes, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Aluminum: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
   1. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms and foundation tube, sleeve, or anchor bolts in position, to prevent displacement during concreting.

D. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use non-staining curing compound.

E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to manufacturer's written instructions.

B. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Provide a plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar as recommended by manuf..
   1. Provide proper lightening ground for each flagpole, if required by manuf..

END OF SECTION 107500

DIVISION 11 EQUIPMENT

SECTION 11 68 33 - ATHLETIC FIELD EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Playfields and equipment, including the following:
   1. "GPKR30HSPL – Custom; 35' High Fixed Uprights" Base Plate Mount High School Original GoalPak Combination Football/soccer Goal System and Accessories
   2. Field Goal and Time Clock Protective pads – EAGLES
   3. Concrete encasements

B. Related Sections include the following:
   1. Division 31 Section "Earth Moving": For excavation for installation of concrete footings.

1.2 SUBMITTALS

A. Shop Drawings: For items included in this Section. Include types of materials, construction details, sizes and layout, and complete information on hardware and accessories.

B. Quality Assurance/Control Submittals
   1. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.
   2. Qualification Data: For installer.

1.3 QUALITY ASSURANCE

A. Standards: Provide athletic equipment complying with or exceeding requirements of the National Federation of State High School Associations.

B. Pre-Installation Conference: Meet with Installer, and installers of substrate construction, and other related work including penetrating work such as playground equipment, Architect and Owner.
   1. Review requirements (Contract Documents), submittals, status of coordinating work, availability of materials, and installation facilities and establish preliminary installation schedule. Review requirements for inspections, tests, certifications, forecasted weather conditions, governing regulations, and proposed installation procedures.

C. Installer Qualifications An installer shall have a minimum of 5 years experience installing athletic equipment and be able to demonstrate successful completion of similar projects.

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements. The most restrictive requirements shall govern.
   1. National Federation of State High School Associations (NFHS)
   2. National Collegiate Athletic Association (NCAA)
   3. International Association of Athletics Federations (IAAF)
   4. Federation International de Football Association (FIFA)
   5. ASTM International
   6. American Sports Builders Association (ASBA)
   7. Manufacturer's Data and Recommended Installation

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Where a model number is used on the Drawings, it refers to the manufacturer and product listed which is specified as the type, size, function, and quality required for this Project.

B. The Architect will consider for acceptance products of other manufacturers provided they equal or exceed the material requirements and functional qualities of the specified product. Requests for Architect/Engineer's approval must be accompanied by the "Substitution Request Form" and complete technical data for evaluation. All materials for evaluation must be received by the Project Manager and Specification Department at least 10 days prior to bid due date. Additional approved manufacturers will be issued by Addendum.

2.2 MATERIALS

A. Combination Goal for Football and Soccer: Goal posts shall be official 24 feet wide and 8 feet above grade. Soccer uprights and cross bars shall be constructed from heavy wall extruded aluminum. Football uprights shall 20 feet high and 23 feet 4 inches apart. Football cross bar to be 10 feet above grade. Provide intermediate support as required. Top of uprights shall be capped with a formed, plated metal cap. Include associated protective padding.
   1. Basis of Design: "GPKR30HSPL – Custom; 35' High Fixed Uprights" Base Plate Mount High School Original GoalPak Combination Football/soccer Goal System and Accessories as manufactured and/or supplied by: Sprotsfield Specialties, Inc., P.O. Box 231, 41155 State Highway 10, Delhi, NY 13753, Tel. (888) 975-3342, Fax (607) 746-8481
   2. Include manufacturer's standard goal post protective pad. Color as required to match school colors.

B. Concrete Encasements
   1. Provide concrete encasement of monuments and football goal posts.
   2. Provide concrete consisting of Portland cement, complying with ASTM C150, aggregates complying with ASTM C33, and with a minimum of 28-day compressive strength of 2500 psi, using at least 4 sacks of cement per cu.yd., 1 inch maximum size aggregate, maximum 3 inch slump, and 2 percent to 4 percent entrained air. Prepare to conform to ASTM C94.

C. Monuments: Shall be as indicated.
   1. Provide monuments at each corner of the football/soccer field.
   2. Provide monuments locating centers of track radii.

PART 3 - EXECUTION

3.1 COMPONENTS

A. GP830HSPL Base Plate Mount High School Football Goal Posts:
   1. Single Base Plate Mount Gooseneck Support: Fabricated of 6" schedule 40 Aluminum Pipe (6.625" O.D.), 5' Radius, 8' Offset, Custom Offset available as needed.
   2. Base Plate Mounting Kit
   3. Crossbar: Fabricated of 6" Schedule 40 Aluminum Pipe (6.625" O.D.)
      a. Length: 23'-4" – High School
      b. Includes Patented AdjustRight feature allowing for easy installation through the adjustment of an internal locking rotating sleeve at both the gooseneck/crossbar and upright/crossbar connections. This adjustment can easily be repeated throughout the life of the football goal post ensuring proper alignment of all components for years of competition and all with the added benefit of no exposed hardware on the face of the goal. Thermal arc sprayed internal textured mating surfaces and anti-vibration enhancements such as serrate washers and nyloc coated bolts ends ensure the AdjustRight Football Goal Posts remain in position.

4. Custom Uprights: Fabricated of extruded 6061-T6 Aluminum Tube (4" O.D.) with Rigid Wire Loop Welded to Upper End
    a. Length: 35'
5. Super Durable Powder Coated Finish with Enhanced Resistance to UV and Fade, Yellow or White
6. Installation Package Consisting of the Following Components:
    a. Base Plate Mounting Kit
    b. Access Frame Kit: 1/8" (0.125") Aluminum Construction with 1" PVC Drain Stub, Includes Two (2) Half Moon Filler Plugs and SG2S Patented Soccer Goal Rear Bottom Ground Bar Retractable Safety Clamp System, Use SG2SGP for Synthetic Turf Installation Applications with the optional Full Size Filler Plug.
7. Included Accessories:
    a. Directional Wind Flags
    b. Touch-up Paint (Powder Coat Finish Specific)
    c. Model Specific Hardware Kit and Installation Instructions
8. Optional Accessories to be provided:
    a. Football Goal Post Pads: 18 oz. Vinyl with Polyester Scrim and Vertically Sewn in Hook and Loop Securement, Standard 6' in Height, color to match school marketing color (RED) , with custom digitally printed lettering and/or graphics reading "EAGLES" in (WHITE) lettering.(owner to have final decision)
        1) GPPR – Round, Fully Encased Vinyl, 18" O.D. and 7" I.D. Polyurethane Foam Core
        2) GPPRDG – Custom Digitally Printed Graphics (to match school marketing logo)
    b. Football end Zone Pylons: Set of Four (4) Orange Vinyl Covered Foam Football End Zone Pylons with Self-Standing Weighted Bases, 18"H x 4"L x 4" W

B. SG824R 8' x 24' Regulation Size Round Faced Soccer Goals:
1. Top Crossbar Fabricated of 6061-T6 Extruded Aluminum Tube Having the Following Attributes:
    a. Length: 24' – Regulation Size
    b. 4.375" Square x 4.688" Round Faced Crossbar, 3/16" (0.1875") Wall Thickness
    c. Super Durable Powder Coated White Finish with Enhanced Resistance to UV and Fade
    d. 3/16" (0.1875") Thick Formed Aluminum Channel Crossbar Attachment Brackets with Welded Tap Blocks, Mill Finish
2. One Piece End Frame Construction Fabricated of 6061-T6 Extruded Aluminum Tube Having the Following Attributes:
    a. 4.375" Square x 4.688" Round Faced Corner Post, 8'H, 3/16" (.1875") Wall Thickness
    b. Rolled Side Frame, 2" x 3" x 0.125" Thick Wall, TIG welded to Corner Upright Posts
    c. Radius Backside Corners
    d. Super Durable Powder Coated White Finish with Enhanced Resistance to UV and Fade
3. Rear Bottom Ground Bar Fabricated of 6061-T6 Extruded Aluminum Tube Having the Following Attributes:
    a. 2" x 2" x 0.25" Thick Wall with Welded ½" Aluminum End Plates
    b. Super Durable Powder Coated White Finish with Enhanced Resistance to UV and Fade
4. Included Accessories:
    a. Welded Aluminum Net Clips with Lifetime Guarantee
    b. 5mm Braided, Knotless White High Tenacity Polypropylene Soccer Net with Rope Bound Perimeter and 4" Square Mesh – 8.2'H x 24.4'L x 4.3'B x 8.6'D
    c. Model Specific Hardware Kit and Installation Instructions
    d. Ground Stake Storage Compartments
    e. All SG824R 8' x 24' Regulation Size Round Faced Soccer Goals Meet and Exceed Current ASTM F2950-14 Standard Safety and Performance Specification for Soccer Goal and F1938-98 Standard Guide for Safer Use of Movable Soccer Goals
    f. Five (5) Year Limited Manufacturer's Product Warranty

5. Included Components:
    a. SGMobile SGMKR – Internal Soccer Goal Portable Mobility Wheel Kit and Handle:
        1) Welded 13 Gauge Stainless Steel Frame
        2) Ultra High Molecular Weight Polyethylene (UHMWPE) Plastic Wheel
        3) Stainless Steel Hardware
        4) Roll Formed Stainless Steel Rod with Stainless Steel Spring and Cushioned Rubber Handle
    b. SG2S – Patented Soccer Goal Safety System:
        1) Rear Bottom Ground Retractable Safety Clamp Fabricated of 3/16” (0.187”) Aluminum
        2) Super Durable Powder Coated White Finish with Enhanced Resistance to UV and Fade
        3) Stainless Steel Assembly Hardware
        4) Access Frame and Cover Fabricate of 1/8” (0.125”) Aluminum with Gasket Seal and 1” PVC Drain Stub
        5) 13 Gauge Stainless Steel Pivot Bar
        6) Galvanized Steel Anchoring Hardware
        7) Use SG2SGP for Synthetic turf installation
6. Field Goal / Time Clock Protective Pads
    a. Round
    b. 6’ Standard height
    c. Premium fully encased construction
    d. 5’1/2” high impact foam and outdoor vinyl
    e. Custom digital graphic – EAGLES – (White) - owner to have final graphic selections prior to the start of construction
    f. Pad Color : (RED) – owner to have final color selection prior to the start of construction

3.2 INSTALLATION

A. All Custom GPKR30HSPL Base Plate Mount High School Original GoalPak Combination Football/Soccer Goal System and Accessories shall be installed as recommended per manufacturer’s written instructions and s indicated on the drawings. Concrete anchoring foundations to be determined by others based on local soil conditions and building codes.

B. Monuments: Shall be properly installed to the required lines and grades, locating the exact points indicated.

C. Football Goal Posts
1. Do not begin prior to completion of final grading. Excavate holes for post footings in firm, undisturbed, or compacted soil. Holes shall have a depth as indicated on the shop drawings and as recommended by the manufacturer. Excavate deeper as required for adequate support in soft and loose soils.
2. Place concrete around sleeves in a continuous pour, tamp for consolidation. Check each sleeve for vertical and top alignment and hold in position during placement and finishing operations.

D. Install protective pads in strict accordance with manufacturer's recommendations and as located on the plans.

END OF SECTION 11 68 33

DIVISION 26

ELECTRICAL

SECTION 26 00 10 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Supplemental requirements generally applicable to the Work specified in Division 26. This Section is also referenced by related Work specified in other Divisions.

1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:
1. A: Ampere, unit of electrical current.
2. AC or ac: Alternating current.
3. AFCI: Arc-fault circuit interrupter.
4. AIC: Ampere interrupting capacity.
5. ASD: Adjustable-speed drive.
6. AWG: American wire gauge; see ASTM B258.
7. BAS: Building automation system.
8. BIL: Basic impulse insulation level.
9. BIM: Building information modeling.
10. CAD: Computer-aided design or drafting.
11. CATV: Community antenna television.
12. CB: Circuit breaker.
13. CU or Cu: Copper.
14. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
15. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
16. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
17. dBm: Decibel absolute power with respect to 1 mW.
18. DC or dc: Direct current.
19. DDC: Direct digital control (HVAC).
20. EGC: Equipment grounding conductor.
21. ELV: Extra-low voltage.
22. EMF: Electromotive force.
23. EMI: Electromagnetic interference.
24. EPM: Electrical preventive maintenance.
25. FLC: Full-load current.
26. GEC: Grounding electrode conductor.
27. GFCI: Ground-fault circuit interrupter.
28. GFPE: Ground-fault protection of equipment.
29. GND: Ground.
30. HACR: Heating, air conditioning, and refrigeration.
31. HDPE: High-density polyethylene.
32. HP or hp: Horsepower.
33. HVAC: Heating, ventilating, and air conditioning.
34. Hz: Hertz.
35. IBT: Intersystem bonding termination.

36. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
37. IP: Ingress protection rating (enclosures); Internet protocol (communications).
38. IR: Infrared.
39. IS: Intrinsically safe.
40. IT&R: Inspecting, testing, and repair.
41. ITE: Information technology equipment.
42. kAIC: Kiloampere interrupting capacity.
43. kcmil or MCM: One thousand circular mils.
44. kV: Kilovolt.
45. kVA: Kilovolt-ampere.
46. kVAr or kVAR: Kilovolt-ampere reactive.
47. kW: Kilowatt.
48. kWh: Kilowatt-hour.
49. lb: Pound (weight).
50. lbf: Pound (force).
51. LCD: Liquid-crystal display.
52. LCDI: Leakage-current detector-interrupter.
53. LED: Light-emitting diode.
54. LRC: Locked-rotor current.
55. LV: Low voltage.
56. MDC: Modular data center.
57. MLO: Main lugs only.
58. MVA: Megavolt-ampere.
59. mW: Milliwatt.
60. MW: Megawatt.
61. MWh: Megawatt-hour.
62. NC: Normally closed.
63. NIU: Network interface unit.
64. NO: Normally open.
65. NPT: National (American) standard pipe taper.
66. OCPD: Overcurrent protective device.
67. PF or pf: Power factor.
68. PVC: Polyvinyl chloride.
69. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
70. RMS or rms: Root-mean-square.
71. RPM or rpm: Revolutions per minute.
72. SCADA: Supervisory control and data acquisition.
73. SCR: Silicon-controlled rectifier.
74. SPD: Surge protective device.
75. SWD: Switching duty.
76. TEFC: Totally enclosed fan-cooled.
77. UL: (standards) Underwriters Laboratories, Inc.; (product categories) UL, LLC.
78. UL CCN: UL Category Control Number.
79. V: Volt, unit of electromotive force.
80. V(ac): Volt, alternating current.
81. V(dc): Volt, direct current.
82. VA: Volt-ampere, unit of complex electrical power.
83. VAR: Volt-ampere reactive, unit of reactive electrical power.
84. VFC: Variable-frequency controller.
85. VOM: Volt-ohm-multimeter.
86. W: Watt, unit of real electrical power.
87. Wh: Watt-hour, unit of electrical energy usage.
88. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:
   1. EMT-S: Steel electrical metallic tubing.

2. EPEC-40: Schedule 40 electrical HDPE underground conduit.
3. EPEC-80: Schedule 80 electrical HDPE underground conduit.
4. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
5. FMC-S: Steel flexible metal conduit.
6. IMC: Steel electrical intermediate metal conduit.
7. LFMC-S: Steel liquidtight flexible metal conduit.
8. PVC-40: Schedule 40 rigid PVC conduit.
9. PVC-80: Schedule 80 rigid PVC Conduit.
10. RGS: See ERMC-S-G.

C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:
1. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
2. THHW: Thermoplastic, heat- and moisture-resistant cable.
3. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.

D. Definitions:

1. Basic Impulse Insulation Level (BIL): Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.
2. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
3. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.
4. 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:

    a. 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.
    b. 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.
    c. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
    d. 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.
    e. Device Box: A box with provisions for mounting a wiring device directly to the box.
    f. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
    g. 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.
    h. 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.

i. 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.

j. 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.

k. 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.

l. 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.

5. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.

    a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.

6. Jacket: A continuous nonmetallic outer covering for conductors or cables.

7. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.

8. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.

9. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.

10. Sheath: A continuous metallic covering for conductors or cables.

11. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.

12. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:

    a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.

    b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.

    c. 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).

    d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.

13. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.

1.3 COORDINATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:

1. Notify Architect, Construction Manager, and Owner no fewer than seven days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.
3. Coordinate interruption with systems impacted by outage including, but not limited to, the following:

a. Exercising generators.
b. Emergency lighting.
c. Fire alarm systems.
d. Security systems.
e. CCTV systems.
f. Mechanical systems.

B. Arrange to provide temporary electrical power in accordance with requirements specified in Division 01.

1.4 PREINSTALLATION MEETINGS

A. Electrical Preconstruction Conference: Schedule conference with Architect and Owner, not later than 10 days after notice to proceed. Agenda topics include, but are not limited to, the following:

1. Electrical installation schedule.
2. Status of power system studies.
3. Utility work coordination and class of service requests.
4. Commissioning activities.

1.5 ACTION SUBMITTALS

PART 2 - PRODUCTS

2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

A. Substitution requests for electrical equipment will be entertained under the following conditions:

1. Substitution requests may be submitted for consideration prior to bidding if accompanied by value analysis data indicating that substitution will comply with Project performance requirements while significantly increasing value for Owner throughout life of facility.
2. Substitution requests may be submitted for consideration concurrently with submission of power system study reports when those reports indicate that substitution is necessary for safety of maintenance personnel and facility occupants.
3. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. After the Electrical Preconstruction Conference, insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL WORK

A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of Work specified in Division 26. Consult Architect for resolution of conflicting requirements.

3.2 CLEANING

A. Waste Management:

1. Dispose of per specifications and local ordinances.

END OF SECTION 26 00 10

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 26 00 10 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Encore Wire Corporation.
2. General Cable; Prysmian Group North America.
3. Southwire Company, LLC.

C. 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."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:

1. Type THHN andType THWN-2: Comply with UL 83.
2. Type THW andType THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
3. Type XHHW-2: Comply with UL 44.

2.2 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Utility Solutions; Hubbell Incorporated.
2. Ideal Industries, Inc.
3. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: One hole with standard 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, 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. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Complete raceway installation between conductor and cable termination points according to Section 26 05 33.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.

B. 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.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Section 26 05 29 "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 6 inch of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 "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 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding connectors.

B. Related Requirements:

1. Section 26 00 10 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product indicated.

B. Field Quality-Control Submittals:

1. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment Grounding Conductor:

1. General Characteristics: 600 V, THHN/THWN-2, copper wire or cable, green color, in accordance with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

2.2 GROUNDING AND BONDING CONNECTORS

A. Performance Criteria:

1. Regulatory Requirements:

a. 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:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

B. UL KDER - Split-Bolt Pressure-Type Grounding and Bonding Cable Connector:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABB, Electrification Business.
b. ERICO; brand of nVent Electrical plc.
c. Greaves Corp.; Essex Products Group, Inc.
d. allG Fabrication (formerly ALT).

2. General Characteristics: Bolts that surround cable and bond to cable under compression when nut is tightened.

a. Copper.

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.

3.2 SELECTION OF GROUNDING AND BONDING CONDUCTORS

A. Conductors: Install solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.

B. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.

C. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch in diameter.

D. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.

E. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.

3.3 SELECTION OF CONNECTORS

A. Conductor Terminations and Connections:

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 Structural Steel: Welded connectors.

3.4 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Special Techniques:

1. 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.

2. Connections: 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. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3. Equipment Grounding:

    a. Install insulated equipment grounding conductors with feeders and branch circuits.

3.5 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by Architect.

B. 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 each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before conductors are connected.

    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.

C. 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.

D. Collect, assemble, and submit test and inspection reports.

1. Report measured ground resistances that exceed the following values:

    a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 Ω.
    b. Substations and Pad-Mounted Equipment: 5 Ω.

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 26 05 26

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Conduit and cable support devices.
2. Support for conductors in vertical conduit.
3. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

B. Related Requirements:

1. Section 26 00 10 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified structural professional engineer to design hanger and support system.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

B. Support for Conductors in Vertical Conduit: 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.

C. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: 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.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-line; brand of Eaton, Electrical Sector.

2) Empire Industries, Inc.
3) Hilti, Inc.
4) ITW Ramset/Red Head; Illinois Tool Works, Inc.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
5. Toggle Bolts: All steel springhead type.
6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 SELECTION

A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA NEIS 101

B. Comply with requirements for raceways specified in Section 26 05 33.13 "Conduits for Electrical Systems."

C. Comply with requirements for boxes specified in Section 26 05 33.16 "Boxes and Covers for Electrical Systems."

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 INSTALLATION OF SUPPORTS

A. 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.

B. 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:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
6. To Light Steel: Sheet metal screws.
7. 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.

C. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 05 50 00 "Metal Fabrications" for 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.

END OF SECTION 26 05 29

SECTION 26 05 33.13 - CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Type EMT-S duct raceways and elbows.
2. Type ERMC-S duct raceways, elbows, couplings, and nipples.
3. Type IMC duct raceways.
4. Type PVC duct raceways and fittings.
5. Fittings for conduit, tubing, and cable.
6. Electrically conductive corrosion-resistant compounds for threaded conduit.
7. Solvent cements.

B. Products Installed, but Not Furnished, under This Section:

1. See Section 26 05 53 "Identification for Electrical Systems" for electrical equipment labels.

C. Related Requirements:

1. Section 26 00 10 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

A. Conduit: A structure containing one or more duct raceways.

B. Duct Raceway: A single enclosed raceway for conductors or cable.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Type EMT-S duct raceways and elbows.
2. Type ERMC-S duct raceways, elbows, couplings, and nipples.
3. Type IMC duct raceways.
4. Type PVC duct raceways and fittings.
5. Fittings for conduit, tubing, and cable.
6. Electrically conductive corrosion-resistant compounds for threaded conduit.
7. Solvent cements.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Type EMT-S duct raceways and elbows.
2. Type ERMC-S duct raceways, elbows, couplings, and nipples.
3. Type IMC duct raceways.
4. Type PVC duct raceways and fittings.
5. Fittings for conduit, tubing, and cable.

6. Electrically conductive corrosion-resistant compounds for threaded conduit.
7. Solvent cements.

PART 2 - PRODUCTS

2.1 TYPE EMT-S DUCT RACEWAYS AND ELBOWS

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 FJMX; including UL 797.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL FJMX - Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit; Atkore International.
    b. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
    c. Western Tube; Zekelman Industries.
    d. Wheatland Tube; Zekelman Industries.

2. Material: Steel.
3. Options:

    a. Interior Coating: Zinc.
    b. Minimum Trade Size: Trade size 3/4.

2.2 TYPE ERMC-S DUCT RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

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 DYIX; including UL 6.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DYIX - Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit; Atkore International.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    d. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
    e. Western Tube; Zekelman Industries.
    f. Wheatland Tube; Zekelman Industries.

2. Exterior Coating: Zinc.
3. Options:

    a. Interior Coating: Zinc with organic top coating.
    b. Minimum Trade Size: Trade size 3/4.

2.3 TYPE IMC DUCT RACEWAYS

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 DYBY; including UL 1242.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DYBY - Steel Intermediate Metal Conduit (IMC):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit; Atkore International.
    b. Calconduit; Atkore International.
    c. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
    d. Western Tube; Zekelman Industries.
    e. Wheatland Tube; Zekelman Industries.

2. Options:

    a. Exterior Coating: Zinc.
    b. Interior Coating: Zinc with organic top coating.
    c. Minimum Trade Size: Trade size 3/4.

2.4 TYPE PVC DUCT RACEWAYS AND FITTINGS

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 DZYR; including UL 651.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DZYR - Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABB, Electrification Business.
b. Calconduit; Atkore International.
c. NAPCO; Westlake Chemical Corp.
d. Opti-Com Manufacturing Network, Inc (OMNI).

2. Dimensional Specifications: Schedule 40.
3. Options:

a. Minimum Trade Size: Trade size 3/4.
b. Markings: For use with maximum 90 deg C wire.

D. UL DZYR - Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABB, Electrification Business.
b. Calconduit; Atkore International.
c. JM Eagle.
d. Opti-Com Manufacturing Network, Inc (OMNI).

2. Dimensional Specifications: Schedule 80.
3. Options:

a. Minimum Trade Size: Trade size 3/4.
b. Markings: For use with maximum 90 deg C wire.

2.5 FITTINGS FOR CONDUIT, TUBING, AND CABLE

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.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DWTT - Fittings for Type ERMC, Type IMC, and Type PVC:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ABB, Electrification Business.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
    d. Southwire Company, LLC.

2. Listing Criteria: UL CCN DWTT; including UL 514B.
3. Options:

    a. Material: Steel.
    b. Coupling Method: Compression coupling.
    c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

D. UL FKAV - Fittings for Type EMT Duct Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit; Atkore International.
    b. Appleton; Emerson Electric Co., Automation Solutions.
    c. Crouse-Hinds; brand of Eaton, Electrical Sector.
    d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
    e. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

2. Listing Criteria: UL CCN FKAV; including UL 514B.
3. Options:

    a. Material: Steel.
    b. Coupling Method: Compression coupling.
    c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

2.6 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

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 FOIZ; including UL Subject 2419.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL FOIZ - Electrically Conductive Corrosion-Resistant Compound for Threaded Conduit:

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.

2.7 SOLVENT CEMENTS

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 DWTT; including UL 514B.

PART 3 - EXECUTION

3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.

B. Outdoors:

1. Exposed and Subject to Severe Physical Damage: ERMC.
2. Exposed and Subject to Physical Damage: ERMC, IMC.

a. Locations less than 8 ft above finished floor.

3. Exposed and Not Subject to Physical Damage: IMC, PVC-80.
4. Concealed Aboveground: IMC, EMT, PVC-80.
5. Direct Buried: PVC-80, PVC-40.
6. Concrete Encased in Trench: PVC-40.

C. Indoors:

1. Exposed and Subject to Severe Physical Damage: ERMC. Locations include the following:

a. Loading docks.
b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
c. Mechanical rooms.
d. Gymnasiums.

2. Exposed and Subject to Physical Damage: IMC EMT. Locations include the following:

a. Locations less than 8 ft above finished floor.
b. Stub-ups to above suspended ceilings.

3. Exposed and Not Subject to Physical Damage: EMT.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Damp or Wet Locations: ERMC IMC.
6. Connection to recessed Luminaires: FMC.

D. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC and IMC: 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 Contract Documents or manufacturers' published instructions, comply with the following:

1. Type EMT-S: Article 358 of NFPA 70 and NECA NEIS 101.
2. Type ERMC-S: Article 344 of NFPA 70 and NECA NEIS 101.
3. Type IMC: Article 342 of NFPA 70 and NECA NEIS 101.
4. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
5. Expansion Fittings: NEMA FB 2.40.
6. 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. Install devices to seal duct raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of duct raceways at the following points:

1) Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2) Where an underground service duct raceway enters a building or structure.
3) Conduit extending from interior to exterior of building.
4) Conduit extending into pressurized duct raceway and equipment.
5) Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
6) Where otherwise required by NFPA 70.

i. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
j. 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.
k. Cut conduit perpendicular to the length. For conduits 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.
l. 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.
m. 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.

n. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to trade size 1-1/4 and insulated throat metal bushings on trade size 1-1/2 and larger conduits terminated with locknuts..

2. Types ERMC and IMC:

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 PVC:

a. Do not install Type PVC conduit where ambient temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
b. Comply with manufacturer's published instructions for solvent welding and fittings.

4. Duct Raceway Terminations at Locations Subject to Moisture or Vibration:

a. Provide insulating bushings to protect conductors, including conductors smaller than 4 AWG..

5. Duct Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

a. ERMC-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
b. EMT: Provide 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.

6. Expansion-Joint Fittings:

a. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F and that have straight-run length that exceeds 25 ft. Install in runs of aboveground ERMC and EMT conduit that are located where environmental temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft.
b. Install type and quantity of fittings that accommodate temperature change listed for the following locations:

1) Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
2) Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
3) Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
4) Attics: 135 deg F temperature change.

c. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
d. Install expansion fittings at locations where conduits cross building or structure expansion joints.

e. 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.

7. Duct Raceways Penetrating Rooms or Walls with Acoustical Requirements: Seal duct raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.
8. Identification: Provide labels for conduit assemblies, duct raceways, and associated electrical equipment.

D. Interfaces with Other Work:

1. Coordinate installation of new products with existing conditions.
2. Coordinate with Section 26 05 29 "Hangers and Supports for Electrical Systems" for installation of conduit hangers and supports.

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 26 05 33.13

SECTION 26 05 43 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Type ERMC-S raceways, elbows, couplings, and nipples.
2. Type IMC raceways.
3. Type PVC raceways and fittings.
4. Fittings for conduit, tubing, and cable.
5. Electrically conductive corrosion-resistant compounds for threaded conduit.
6. Solvent cements.
7. Duct accessories.
8. Handholes and boxes for exterior underground wiring.
9. Duct sealing.

B. Related Requirements:

1. Section 26 00 10 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 26 05 19 "Low-Voltage for Electrical Power Conductors and Cables" for nonmetallic underground conduit with conductors (Type NUCC).

1.2 ACTION SUBMITTALS

A. Product Data:
1. Ducts, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
2. Accessories for manholes, handholes, boxes, and other utility structures.

B. Shop Drawings:

C. Field Quality-Control Submittals:

1. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Source Quality-Control Submittals:

1. Source quality-control reports.

1.4 REGULATORY AGENCY APPROVALS

A. Submit Shop Drawings for electric utility duct banks and structures for action by Architect prior to submitting for approval by electric utility.

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.

B. Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit; Atkore International.
b. Calconduit; Atkore International.
c. Crouse-Hinds; brand of Eaton, Electrical Sector.
d. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
e. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
f. Western Tube; Zekelman Industries.
g. Wheatland Tube; Zekelman Industries.

2. Exterior Coating: Zinc.
3. Options:

a. Interior Coating: Zinc with organic top coating.
b. Minimum Trade Size: Trade size 3/4.
c. Colors: As indicated on Drawings.

2.2 TYPE IMC RACEWAYS

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 1242 and UL CCN DYBY.

B. Steel Electrical Intermediate Metal Conduit (IMC):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABB, Electrification Business.
b. Allied Tube & Conduit; Atkore International.
c. Calconduit; Atkore International.
d. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
e. Western Tube; Zekelman Industries.
f. Wheatland Tube; Zekelman Industries.

2. Options:

a. Exterior Coating: Zinc.
b. Interior Coating: Zinc with organic top coating.
c. Minimum Trade Size: T size 3/4.
d. Colors: As indicated on Drawings.

2.3 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 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Calconduit; Atkore International.
b. JM Eagle.
c. NAPCO; Westlake Chemical Corp.
d. Opti-Com Manufacturing Network, Inc (OMNI).

2. Dimensional Specifications: Schedule 40.
3. Options:

a. Minimum Trade Size: Trade size 3/4.
b. Markings: For use with maximum 90 deg C wire.

C. Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Calconduit; Atkore International.
b. JM Eagle.
c. Opti-Com Manufacturing Network, Inc (OMNI).

2. Dimensional Specifications: Schedule 80.
3. Options:

a. Minimum Trade Size: Trade size 3/4.
b. Markings: For use with maximum 90 deg C wire.

2.4 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.

B. Metallic Fittings for Type ERMC, Type IMC, and Type PVC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Appleton; Emerson Electric Co., Automation Solutions.
b. Crouse-Hinds; brand of Eaton, Electrical Sector.
c. Konkore Fittings; Atkore International.
d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
e. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

2. General Characteristics: UL 514B and UL CCN DWTT.
3. Options:

    a. Material: Steel.
    b. Coupling Method: Compression coupling.
    c. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
    d. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

2.5 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

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 Subject 2419 and UL CCN FOIZ.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. ABB, Electrification Business.

2.6 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.

2.7 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. Source Quality Control:

1. Polymer Concrete and Nonconcrete Handhole and Pull-Box Prototypes: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests must be for specified tier ratings of products supplied. Testing machine pressure gages must have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

    a. Tests of materials must be performed by independent testing agency.
    b. Strength tests of complete boxes and covers must be by independent testing agency or manufacturer. Qualified registered professional engineer must certify tests by manufacturer.

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, provide products by the following:

    a. Armorcast Products Company; brand of Hubbell Utility Solutions; Hubbell Incorporated.
    b. MacLean Highline.
    c. NewBasis.
    d. Oldcastle Infrastructure Inc.; CRH Americas.
    e. 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. Conduit Entrance Provisions: Conduit-terminating fittings must mate with entering ducts for secure, fixed installation in enclosure wall.
6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
7. Duct Entrance Provisions: Duct-terminating fittings must mate with entering duct for secure, fixed installation in enclosure wall.
8. Handholes 24 inch wide by 24 inch long and larger must have factory-installed inserts for cable racks and pulling-in irons.
9. Options:

    a. Color: Gray.

2.8 DUCT SEALING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business.
2. American Polywater Corporation.
3. CommScope, Inc.
4. Gardner Bender.
5. Ideal Industries, Inc.
6. NSi Industries LLC.
7. TE Connectivity Ltd.

B. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Compound must be capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduit, conduit and duct coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals. Duct sealing compound must be removable without damaging ducts or cables.

C. Inflatable Duct-Sealing System: Wraparound inflatable bladder that seals ducts that are empty or containing conductors against air and water infiltration. System is suitable for use in steel, plastic, or concrete ducts and penetrations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of duct, 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 entrances into handholes, and boxes with final locations and profiles of duct 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 will drain to manholes and handholes, and as approved by Architect.

3.2 SELECTION OF UNDERGROUND DUCTS

A. Duct for Electrical Branch Circuits: PVC-40, direct buried unless otherwise indicated.

B. Bored Underground Duct: EPEC-40 unless otherwise indicated.

C. Underground Ducts Crossing Paved Paths Walks and Driveways: PVC-40.

3.3 SELECTION OF UNDERGROUND ENCLOSURES

A. Handholes and Boxes:
1. Units in Sidewalk and Similar Applications with Safety Factor for Nondeliberate Loading by Vehicles: Heavy-duty fiberglass units with polymer concrete frame and cover, SCTE 77, Tier 8 structural load rating.
2. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested in accordance with SCTE 77 with 3000 lbf vertical loading.
3. Cover design load must not exceed load rating of handhole or box.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Section 31 20 00 "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 32 92 00 "Turf and Grasses".

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 01 73 00 "Execution."

3.5 INSTALLATION OF DUCTS

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.
2. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:
1. Slope: Pitch duct minimum slope of 1:300 down toward handholes and away from buildings and equipment.
2. Expansion and Deflection Fittings: Install expansion and deflection fitting in each duct in area of disturbed earth adjacent to handhole.
3. Install expansion fitting near center of straight line duct with calculated expansion of more than 3/4 inch.
4. 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.
    c. Duct must have maximum of 180 degrees of bends between pull points.

5. 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, and encase coupling with minimum 3 inch of concrete for minimum of 12 inch on each side of coupling.

    a. Install insulated grounding bushings on steel raceway terminations that are less than 12 inch below grade or floor level and do not terminate in hubs.

6. 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. Install steel raceway penetrations of building walls as specified in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
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.

9. Direct-Buried Duct:

    a. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 31 20 00 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inch in nominal diameter.
    b. Width: Excavate trench 3 inch wider than duct on each side.
    c. Depth: Install top of duct at least 36 inch below finished grade unless otherwise indicated.
    d. Set elevation of top of duct bank below frost line.
    e. Place minimum 3 inch of sand as bed for duct. Place sand to minimum of 6 inch above top level of duct.
    f. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
    g. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 ft of duct. Place spacers within 24 inch of duct ends. Stagger spacers approximately 6 inch between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire

assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

h. Install duct with minimum of 3 inch between ducts for like services and 6 inch between power and communications duct.

i. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inch over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 31 20 00 "Earth Moving" for installation of backfill materials.

10. Ground ducts and duct banks in accordance with Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Reference Standards:

1. Consult Architect for resolution of conflicting requirements.

B. 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 removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
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. Ground handholes and boxes in accordance with Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by Architect.

B. Tests and Inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide minimum 12 inch long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.
3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

C. Nonconforming Work:

1. Underground ducts, raceways, and structures will be considered defective if they do not pass tests and inspections.
2. Correct deficiencies and retest as specified above to demonstrate compliance.

D. Assemble and submit test and inspection reports.

END OF SECTION 26 05 43

SECTION 26 05 44 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Round sleeves.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Pourable sealants.

B. Related Requirements:

1. Section 26 00 10 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

A. Steel Wall Sleeves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, LLC.
b. CCI Piping Systems.
c. Flexicraft Industries.
d. GPT; a division of EnPRO Industries.
e. Specified Technologies Inc.

2. General Characteristics: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

B. Round, Galvanized-Steel, Sheet Metal Sleeves:

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. Benefast.
b. Specified Technologies Inc.

2. General Characteristics: Galvanized-steel sheet; thickness not less than 0.0239 inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 SLEEVE-SEAL FITTINGS

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. Hooldrite; a division of Reliance Worldwide Corporation.

B. General Characteristics: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit must have plastic or rubber waterstop collar with center opening to match piping OD.

2.3 GROUT

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. Specified Technologies Inc.
2. W. R. Meadows, Inc.

B. General Characteristics: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000 psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.4 POURABLE SEALANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carlisle Syntec Systems.
2. GAF.
3. Johns Manville; a Berkshire Hathaway company.
4. Specified Technologies Inc.

B. Performance Criteria:

1. General Characteristics: Single-component, neutral-curing elastomeric sealants of grade indicated below.

a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 92 00 "Joint Sealants."

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4 inch annular clear space between sleeve and raceway or cable, unless sleeve-seal system is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inch above finished floor level. Install sleeves during erection of floors.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve-seal systems. Size sleeves to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

E. Underground, Exterior-Wall and Floor Penetrations:

1. Install steel pipe sleeves with integral waterstops. Size sleeves to allow for 1 inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Install sleeve during construction of floor or wall.

3.2 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION 26 05 44

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Bands and tubes.
3. Tags.
4. Cable ties.
5. Miscellaneous identification products.

B. Related Requirements:

1. Section 26 00 10 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. 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.

B. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, must comply with UL 969.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 1000 V or Less:

1. Black letters on orange field.

B. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.

1. Color must be factory applied.
2. Colors for 208Y/120 V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.
d. Neutral: White.
e. Ground: Green.

C. Warning Label Colors:

1. Identify system voltage with black letters on orange background.

D. Equipment Identification Labels:

1. Black letters on white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Champion America.
c. HellermannTyton.
d. LEM Products Inc.
e. Panduit Corp.
f. emedco.

B. Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, polyester flexible label with acrylic pressure-sensitive adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Brother International Corporation.
c. Grafoplast Wire Markers.
d. Ideal Industries, Inc.
e. LEM Products Inc.
f. Panduit Corp.
g. emedco.

2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over legend. Labels sized such that clear shield overlaps entire printed legend.

3. Marker for Labels:

a. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

C. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Brother International Corporation.
c. HellermannTyton.
d. Ideal Industries, Inc.
e. LEM Products Inc.
f. Panduit Corp.
g. emedco.

2. Minimum Nominal Size:

a. 1-1/2 by 6 inch for raceway and conductors.
b. 3-1/2 by 5 inch for equipment.
c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inch long, with diameters sized to suit diameters and that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. HellermannTyton.
c. Marking Services Inc.
d. Panduit Corp.

2.5 CABLE TIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. HellermannTyton.
2. Ideal Industries, Inc.
3. Marking Services Inc.
4. Panduit Corp.

B. 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.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.

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 INSTALLATION

A. 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.

B. Verify identity of item before installing identification products.

C. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

D. Apply identification devices to surfaces that require finish after completing finish work.

E. System Identification for Raceways and Cables under 1000 V: Identification must completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

F. 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.

G. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.

H. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.

I. Self-Adhesive Labels:

1. Install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high label; where two lines of text are required, use labels 2 inch high.

J. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.

K. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.

L. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

M. 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 IDENTIFICATION SCHEDULE

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. 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. Accessible Raceways and Metal-Clad Cables, 1000 V or Less, for Service, Feeder, and Branch Circuits, More Than 15A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.

D. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label.
2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION 26 05 53

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Nonfusible switches.
   2. Enclosures.

B. Related Requirements:

   1. Section 26 00 10 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

A. GFEP: Ground-fault circuit-interrupter for equipment protection.

B. GFLS: Ground-fault circuit-interrupter for life safety.

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.

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 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. 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.

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.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Type HD, Heavy Duty, Two Pole, Single Throw, 240 V(ac), 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

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. 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.

E. 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 SELECTION OF ENCLOSURES

A. Outdoor Locations: UL 50E, Type 3R.

3.2 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.

3.3 IDENTIFICATION

A. Comply with requirements in Section 26 05 53 "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.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. 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.

f. Verify correct phase barrier installation.
g. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

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 switch 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.

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. 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.

f. Inspect operating mechanism, contacts, and chutes in unsealed units.

2. 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.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 26 28 16

DIVISION 31

EARTHWORK

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Removal of existing natural turf areas.
   2. Protecting existing trees, shrubs, groundcovers, plants, and grass to remain.
   3. Clearing and grubbing.
   4. Removing above- and below-grade site improvements as required.
   5. Disconnecting, capping or sealing, relocating or removing site utilities as required.
   6. Maintenance and or installation of temporary erosion and sedimentation control measures as required by IDEM, local officials and governing bodies.

B. Related Sections include the following:
   1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities.
   2. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.

1.2 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1/2 inch in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

1.3 SYSTEM DESCRIPTION

A. Requirement of Regulatory Agencies: All work shall conform to regulations, codes, safety requirements, ordinances, and laws of federal, state, and local governing bodies having jurisdiction. Keep a copy of the Soil Erosion and Sediment Control Plan on-site at all times during construction. For purposes of erosion control, Contractor shall be considered the “operator” of the site and shall comply with all rules of Rule 5. Contractor shall be responsible for maintaining and installing erosion control measures as noted on Drawings and additional measures required by governing agencies.

B. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or air borne dust to adjacent properties and sidewalks according to requirements of authorities having jurisdiction, sediment, and erosion control drawings, and EPA 832/R-92-005, whichever is more stringent.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Quality Assurance/Control Submittals
   1. Contractor shall supply a copy of the log kept of erosion control monitoring and repairs, as well as means and methods for temporary controls.
   2. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

1.6 PROJECT 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 traffic ways if required by authorities having jurisdiction.

B. Notify corporations, companies, individuals, and local authorities owning conduits, wires, or pipes that will be affected by this Work. Arrange for removal of wires running to or on the property that will interfere with the execution of the Work.
   1. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

C. Protect and maintain conduit, drains, sewers, pipes, and wires that are to remain. Provide and maintain markers for location of underground facilities.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."
   1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

B. Soil Erosion and Sedimentation Control
   1. Filters, Sediment Traps, and Silt Fence.

   2. Temporary seeding.
      a. Northern States Temporary Seeding Mix; Seeding Rate: 8 lbs/1,000 sq.ft. of a blend of top 3 performing varieties of Kentucky bluegrass or blend of top 3 performing varieties of creeping red fescue varieties for the project area as determined by the National Turf grass evaluation Program. Add 2 lbs of annual rye to the above seed mixes and rates.
   3. Mulch shall be the following:
      a. 100% Wood fiber hydromulch

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain. The contractor shall layout and stake new improvements and shall walk the site with the Architect to field verify vegetation to remove before the commencement of clearing operations.

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 materials and measures if required to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to a sediment and erosion control plan, specific to the site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

B. Sequence of Construction Activities
   1. Install silt fence, sediment traps, and all other erosion control measures as part of initial phase of any work to ensure maximum silt retention.
   2. Mass grade the site keeping disturbed areas to a minimum at all times. Application of temporary seeding will be required for all disturbed areas not covered by new improvements or that cannot be final seeded within a time period that will prevent slope erosion. Temporary seeding will be required on all areas to be left disturbed in excess of 15 days. All temporary seeded areas shall be seeded and then hydro mulched in conformance with directions noted on plans.
   3. Control mud accumulation on all streets surrounding project by installing stone surface at each location where construction traffic leaves the site. Keep dust to a minimum by utilizing sprinkling, calcium chloride, vegetative cover, spray on adhesives, or other approved methods.
   4. Maintain all filters and traps during demolition and grading to prevent any blockages from accumulated sediment. Clean sediment traps, filters, and fencing after each storm event and on a weekly basis. Replace all materials that are clogged or ineffective, 20 percent of capacity lost or obstructed.
   5. As storm sewer lines are installed, install a silt barrier at each inlet and at each inlet noted.

C. Temporary Seeding
   1. Mulch shall be the following with a coverage of at least 75 percent of the soil surface:
      a. Install wood fiber at a rate of 1 ton/acre with a hydro mulcher and tacking agent.
   2. Check for erosion damage after each storm event and on a weekly basis. Reseed and mulch as required.
   3. If grading occurs during December, January, or February, dormant seeding and mulching shall be completed. All sediment filters and traps are to be in place prior to bulk earth moving and clearing.
   4. All existing lawns and seeded areas as defined shall be protected and repaired if disturbed in accordance with directions noted on plans for permanent seeding.

D. Monitoring: Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
   1. Monitor soil erosion control practices at least weekly to determine the effectiveness of the installation any repairs required. Keep a detailed log of these observations and remedies taken.
   2. Clean out siltation filters when siltation reduces capacity by 20 percent. Material removed may be dried and used as embankment material only in areas approved by the A/E.

E. Erosion and sedimentation controls shall remain in place until the completion of construction phase.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing.
   1. Do not store construction materials, debris, or excavated material within fenced area.
   2. Do not permit vehicles, equipment, or foot traffic within fenced area.
   3. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
   1. Cover exposed roots with burlap and water regularly.
   2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
   3. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
   4. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in accordance with ANSI A300.
   1. Replace trees that cannot be repaired and restored to full-growth status, as determined by Architect.

3.4 UTILITIES

A. Locate, identify, relocate or disconnect, and seal or cap off utilities indicated to be removed or as encountered.
   1. Arrange with utility companies to shut off indicated utilities.

B. 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 A/E &Construction Manager not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

C. Excavate for and remove underground utilities indicated to be removed.

D. Existing storm drain lines to be maintained and utilized in new construction shall be cleaned and flushed clear and protected and repaired until reconnected to new storm systems.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation within areas as noted on plans or as required to allow for installation of new improvements.
   1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
   2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
   3. Completely remove stumps of trees, shrubs, and other vegetation including the roots.
   4. Use only hand methods for grubbing within tree protection zone.
      Trees and shrubs in areas of new improvements or grading shall be removed in their entirety

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 EXISTING SYNTHETIC TURF REMOVAL

A. Carefully remove existing synthetic turf in its entirety including sand/rubber infill and legally dispose of off-site in a method and in a location as acceptable to governmental agencies.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Where catch basins or other underground structures are removed and drainage lines are encountered that cannot be abandoned, provide and install the necessary sewer tile so that maintenance of the lines can be assured. This will particularly apply to subsurface drainage lines, which should be maintained to assure proper drainage. Obtain Architect/Engineer approval for rerouting such lines.
   1. Fill the open ends of drain lines to be removed in structures with concrete or masonry, as per Local and State Codes.

3.8 DISPOSAL

A. Disposal: 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.
   1. Burning of combustible cleared and grubbed materials is not permitted on Owner’s property.

END OF SECTION 31 10 00

SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Preparing subgrades for concrete curbs, synthetic grass surfacing, lawns and grasses.
   2. Subbase course for concrete.
   3. Subsurface drainage backfill for trenches.
   4. Excavating and backfilling for utility trenches.
   5. Installation and coordination of misc. storm piping and drainage work.
   6. Installation and rough grading of topsoil in lawn and all other disturbed areas not covered in other improvements.

B. Related Sections include the following:
   1. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
   2. Division 31 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal or relocation of above- and below-grade improvements and utilities.
   3. Division 32 Section “Synthetic Grass Surfacing” for synthetic grass infill system.
   4. Division 33 Section “Sub-drainage”

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. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from offsite or outside of demolition/grading areas for use as fill or backfill.

D. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

E. 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 unit prices.
   2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
   3. 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, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Rock: Rock material in beds, ledges, un-stratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 50 blows/2 inches when tested by an independent geotechnical testing agency, according to ASTM D 1586.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course (Aggregate): Course placed between the subgrade and base course for hot-mix asphalt pavement, or courses placed between the subgrade and cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

L. Topsoil; ASTM D 5268, ph range of 5.5-7, a fertile, friable loam with a range of 2 percent to 20 percent organic material content, free of stones ½ inch or larger in any dimension and other extraneous materials harmful to plant growth.

1.3 QUALITY ASSURANCE

A. Blasting: Is not permitted:

B. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

1.4 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.
1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Architect immediately for directions as to procedure. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
2. Notify Construction Manager not less than two days in advance of proposed utility interruptions.
3. Do not proceed with utility interruptions without written permission.
4. Contact utility-locator service for area where Project is located before excavating.
Demolish and completely remove from site existing underground utilities indicated to be removed or as required. Coordinate with utility companies to shut off services if lines are active.

B. Utility Locator Service: Notify utility locator service or "Call Before You Dig" for area where Project is located before beginning earth moving operations.

C. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 31 Section "Site Clearing" are in place.

D. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment
3. Foot traffic
4. Erection of sheds or structures
5. Impoundment of water

6. Excavation or other digs unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

E. Do not direct vehicle or equipment exhaust towards protection zones.

F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements, provide product by the manufacturers specified.

B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product. The “Substitution Request Form” and complete technical data for evaluation must accompany requests for A/E’s approval. All materials for evaluation must be received by the Project Manager and Specification Department at least 10 days prior to bid due date. Additional approved manufacturers will be issued by Addendum.

2.2 SOIL MATERIALS

A. General: Provide borrow soil materials and topsoil from offsite or outside of demolition/grading areas when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM or a combination of these groups; free of rock or gravel larger than 2 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 D 2487 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 D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Engineered Fill/Granular Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve, unless otherwise noted.
   1. Aggregates used for subsurface storm water storage, underdrains, or storm sewer backfill shall be washed limestone, washed gravel, or river rock. The aggregates shall be 100 percent crushed in all cases.

F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

G. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

H. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

I. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

K. Synthetic Grass Surfacing Base Materials: The base materials are critical to the performance of the entire system and should contain the necessary components and characteristics to satisfy local conditions.

1. Only as required for replacement of existing base materials not suitable for new surfacing.
2. Soil Separator: A geo-textile fabric shall be placed over the entire subgrade and within the pipe trenches prior to the installation of the base materials to minimize contamination of the aggregate and possible clogging of the perforated drainage pipes.
3. Aggregate: The aggregate materials utilized to construct the field base must be a properly, graded, crushed stone to provide a balance between stability and permeability. A highly fractured material is desirable to provide the surface stability required for the synthetic turf surfacing, or porous paving as applicable. The graded aggregate particle sizes must be tightly controlled to fall within the bandwidth for all specified sieve sizes with just enough fines to provide stability while still allowing for sufficient drainage. Minimum stability and permeability requirements should be determined and confirmed by an independent certified laboratory prior to construction of the base course.
   a. Aggregate materials shall be approved by the Synthetic Grass Surfacing Manufacturer and comply with their requirements.
4. Compaction: The base materials should be thoroughly compacted to prevent differential settlement across the field area. Minimum compaction levels should not be less than 90 percent density as measured by a standard proctor test or as required by the Synthetic Grass Surfacing Manufacturer. Special attention should be given to backfill compaction of any utility trenches that cross the field area.
5. Water Permeability: Water permeability rates for both the field's surfacing and the field base materials should be designed to accommodate the local weather patterns. The permeability of both the field surface and the base materials will typically decrease over the life of the field. An adequate factor of safety should be utilized to provide initial infiltration rates for the completed field above those required by the local weather conditions.

2.3 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
   3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
   4. Tear Strength: 56 lbf; ASTM D 4533.
   5. Puncture Strength: 56 lbf; ASTM D 4833.
   6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
   7. Permittivity: 0.2 per second, minimum; ASTM D 4491.
   8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Grab Tensile Strength: 247 lbf; ASTM D 4632.
   3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
   4. Tear Strength: 90 lbf; ASTM D 4533.
   5. Puncture Strength: 90 lbf; ASTM D 4833.
   6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
   7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
   8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

C. Reinforcing Fabric
   1. Reinforcing fabric shall be made from woven polypropylene containing heavy monofilament and fibrillated yarns with the minimum physical properties:

a.	Grab Strength	ASTM D4632	250 lbs
b.	Mullen Burst	ASTM D3786	750 psi
c.	Trapezoidal Tear	ASTM D4533	110 psi
d.	Water Flow Rate	ASTM D4491	40 gpm

2. Typically used as subgrade stabilization

D. Reinforcing Geogrid
1. Reinforcing geogrid shall be made from polypropylene with the minimum physical properties:

a.	True Initial Modulus In Use	Type I	17,140 lb/ft.
b.	Flexural Stiffness	Type I	250,000 cm
c.	Aperture Stability Modulus	Type I	3.2 deg
d.	Resistance to Installation Damage	Type I	70% GP

2. Typically used as subgrade stabilization

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which excavating, filling, and grading are to be performed and notify the A/E in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in an acceptable manner.

B. Proof Rolling: After topsoil has been stripped and excavation made to required subgrade elevations, proof roll areas to be occupied by the new surface areas using a medium weight roller. A representative from the Soil Testing and Inspection Laboratory shall be present during all proof rolling operations.
1. Excavation of unsuitable proof roll bearing materials
   a. Concrete or paved Surfaces
      1) Unsuitable bearing materials in areas to receive concrete or paved surfaces shall not be undercut without written authorization from the A/E.
      2) Unsuitable bearing materials excavated without written approval from the A/E shall be considered unauthorized excavation. No contract adjustments will be made for unauthorized excavation.
      3) Prior to excavation of unsuitable materials, the contractor shall report to the soils engineer, [Construction Manager,] and/or [A/E] the quantity of unsuitable soil to be excavated. The contractor shall report the following information:
         a) Quantity in cubic yards
         b) Quantity square yards
         c) The average depth of cut.
2. Using the quantity information, the architect will consult with the soils engineer regarding alternative methods to remedy the unsuitable soil. Alternatives include:
   a. Installation of an approved reinforcing fabric or reinforcing geogrid
   b. Installation of Hydrated Lime
   c. Removal and replacement of the unsuitable material
      1) The depth of additional excavation shall be based on the depth of deflection measured during the proofroll operation:
         a) 0 to 1/2 inch – no additional excavation
         b) >1/2 inch to 1 inch – 12” of additional excavation
         c) >1 inch to 1.5 inch – 18” of additional excavation
         d) >1.5 to 2.5 inch – 24” of additional excavation plus an approved reinforcement geosynthetic.
      2) Replacement material shall consist of crushed concrete, 100 percent crushed gravel or 100 percent crushed limestone.
         a) The size of replacement aggregate material shall range from 1.5 inches to no greater than 3 inches
   d. Disc and Dry
      1) No additional payment will be made to disc and dry.
   e. Other remedy as suggested by the soils engineer or contractor.
3. The A/E will recommend to the owner implementing an alternative or combination of alternatives based upon cost, effectiveness, scheduling impact and recommendations from the soils engineer. The owner shall issue final approval of the remedy.

4. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by A/E, without additional compensation.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."

C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing," during earthwork operations.

D. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

E. Provide erosion control measures in accordance with erosion control plan to prevent erosion or displacement of soils and discharge of soil bearing water runoff or airborne dust to adjacent properties and walkways.

F. Synthetic Grass Surfacing Subgrade Preparation: The subgrade should provide a stabilized foundation upon which base materials and subsequent components of playing field systems will be installed.
   1. Only as required for replacement of existing base materials not suitable for new surfacing.
   2. Function: It should also provide the pitched surface on which storm water is directed toward the active drainage system for evacuation.
   3. Shape and Compaction: Prior to placement of base materials, the subgrade should be shaped to an appropriate profile and compacted by proof rolling to obtain a firm even surface. Depressed areas should be filled and unsuitable materials removed and replaced with clean fill or aggregate. Compaction should be performed to achieve a minimum of 90 percent in accordance with ASTM D698 Standard Proctor Method. The appropriate moisture content must be maintained in the field subgrade to allow for optimal levels of compaction.
   4. Subgrade (Rough) Planarity: The tolerances for the finished subgrade should not exceed 1/2 inch as measured by a 10 foot straight edge. Grading of the subgrade shall minimize ponding to the extent practical. The use of laser guided and controlled equipment is recommended to maintain planarity.
   5. Proof-roll the subgrade in presence of Owner’s Testing Agency and Synthetic Grass Surfacing Manufacturer to assure a consistent and uniform compaction of the entire field. The Synthetic Grass Surfacing Manufacturer must approve the subgrade preparation before commencing drainage installation and aggregate subbase installation.

3.3 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
   2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.4 EXPLOSIVES

A. Explosives: Do not use explosives.

3.5 EXCAVATION, GENERAL

A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract time may be authorized for rock excavation.
   1. Earth excavation includes soil, boulders, and other materials not classified as rock or unauthorized excavation.
      a. Intermittent drilling if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
   2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
      a. 24 inches outside of concrete forms other than at footings.
      b. 12 inches outside of concrete forms at footings.
      c. 6 inches outside of minimum required dimensions of concrete cast against grade.
      d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
      e. 6 inches beneath bottom of concrete slabs on grade.
      f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 incheswide.

B. Additional Excavation: When excavation has reached required subgrade elevations, notify Soils Engineer and A/E so he can observe conditions.
   1. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by the Representative of Soils Testing and Inspection Laboratory after approval by A/E.
   2. Removal of unsuitable material and its replacement, as directed, will be paid on the basis of contract conditions relative to changes in work.
   3. The assumed quantity of additional excavation for bidding is zero cubic yards, unless otherwise noted. As such, all future estimated quantities of additional excavation should be considered a substantial change in quantity.
   4. All additional excavation or rock excavation performed without written authorization by the A/E shall be considered unauthorized excavation for which no additional payment will be made.
   5. Additional excavation and its replacement will be paid for based on contract provisions for changes in the work or unit prices where applicable.

C. Stability of Excavations: Slope sides of excavations to comply with codes and ordinances having jurisdiction. Shore and brace where sloping is not possible either because of space restriction or stability of material excavated.
   1. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
   2. Comply with OSHA, "Construction Standards for Excavations, 29 CFR".

D. Shoring and Bracing: Provide materials for shoring and bracing such as sheet piling, uprights, stringers, and cross-braces in good serviceable condition.
   1. Provide minimum requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.
   2. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

E. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.
   1. Do not allow water to accumulate in excavations. Remove water to prevent softening of pavement subgrade, foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, sumps, suction, and discharge lines, and other dewatering system components necessary to convey water away from excavations.
   2. Convey water removed from excavations and rainwater to collecting or runoff areas. Provide and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.

3.6 EXCAVATION FOR CONCRETE SURFACES AND PAVEMENTS

A. Excavate surfaces under pavements, to indicated lines, cross sections, elevations, and subgrades.

3.7 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: 12 inches each side of pipe or conduit, unless otherwise noted.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. . Remove projecting stones and sharp objects along trench subgrade.
   1. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.
   2. Where rock is encountered, carry excavation 6 inches below required elevation and backfill with a 6-inch layer of crushed stone or gravel prior to installation of pipe.
   3. For pipes or conduit 6 inches or larger in nominal size, tanks and other mechanical/electrical work indicated to receive subbase, excavate to subbase depth indicated, or, if not otherwise indicated, to 6 inches below bottom of work to be supported.
   4. Except as otherwise indicated, excavate for exterior water bearing piping (water, steam, condensate, drainage) so top of piping is not less than 5 feet below finished grade.
   5. Grade bottoms of trenches, notching under pipe bells to provide solid bearing for entire body of pipe.
   6. Where welded and wrapped black iron pipe, wrought iron pipe, or soft type "K" copper tubing with silver soldered joints is specified, a narrow trench made with special trenching machines will be acceptable, providing it can maintain a straight, true-to-line trench bottom in undisturbed earth to prevent damage to the pipe.
   7. Excavation for manholes and other accessories to have 12 inches minimum and 24 inches maximum clearances on all sides.

3.8 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, or controlled low-strength material may be used when approved by A/E.
   1. Fill unauthorized excavations under other construction or utility pipe as directed by A/E or as required by governing agencies.

3.9 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. Soil materials shall be placed in separate stockpiles (fill soil, topsoil, clay for retention pond liner, etc.) away from edge of excavations. Do not store within drip line of remaining trees.
   2. Dispose of excess soil material and waste materials as specified hereinafter.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade
   2. Surveying locations of underground utilities for Record Documents.
   3. Testing and inspecting underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.
   6. Removing temporary shoring and bracing, and sheeting.
   7. Install permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 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. Backfill trenches excavated under footings and within 18 inches of bottom of footings, piers, or foundations with satisfactory soil; fill with concrete or controlled low-strength material to elevation of bottom of footings.
   1. Wrap pipe with one inch glass fiber blanket by pipe installer prior to placement of concrete.

D. Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways or paving. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
   1. Backfill when piping or conduit is greater than 30 inches below surface of roadways and paving may be either controlled low-strength material or granular fill.

E. 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 utility pipe or conduit, unless otherwise noted.
   1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
   2. Backfill within the building and piping or conduit below sidewalk shall be granular fill.

F. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the utility pipe or conduit.

G. Trench Backfilling for Storm Piping Outside the Building: Backfill storm piping in four phases. Bedding, haunching, initial and finish backfill. Place each lift to equal depths on both sides of pipe. Each lift shall extend from the side of the pipe to the trench wall.

H. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

I. Place and compact final backfill of satisfactory soil to final subgrade elevation. Properly compact and stabilize fill before permitting weight or traffic on the backfill.

J. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 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 and planted areas, use satisfactory soil material to where topsoil begins.
2. Under slabs, use satisfactory soil material to subgrade elevation below recycled concrete and washed #8 limestone aggregate.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 LAWN PREPARATION

A. Limit lawn subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1/2 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
1. Spread topsoil/planting soil to a depth of 6 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if topsoil or subgrade is frozen, muddy, or excessively wet.
a. Spread approximately 1/2 the thickness of topsoil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of topsoil.
b. Reduce elevation of planting soil to allow for soil thickness of sod if specified.

C. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
2. Loosen surface soil to a depth of at least 6 inches.
3. Remove stones larger than 1/2 inch in any dimension and sticks, roots, trash, and other extraneous matter.
4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

3.14 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 as indicated in geotechnical report.
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.

3.15 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 values in the soils report and the following percentages of maximum dry unit weight according to ASTM D 698 (Standard):
   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 below level of crushed concrete or limestone aggregate at 95 percent.
   2. Under pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
   3. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
   4. Under lawns or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
   5. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.16 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.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from building pads and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Lawn or Unpaved Areas: Plus or minus 1 inch.
   2. Walks: Plus or minus 1/2 inch.
   3. Pavements: Plus or minus 1/2 inch.
   4. Synthetic Turf and Athletic fields: Plus or minus 1/2 inch. The use of laser guided and controlled equipment will be required to maintain planarity. Documentation should be provided showing compliance with planarity requirements.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

D. Installation of Topsoil: Install approved topsoil in minimum 6” compacted layer in all disturbed lawn areas and landscape planting areas. If quantity of stockpiled topsoil in insufficient supply acceptable topsoil from off site sources to meet 6” compacted depth. In wet retention pond install minimum 6” topsoil on pond banks and to 3’ below nominal water elevation.

3.17 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Division 33 Section "Subdrainage."

B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
   1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
   1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.

3.18 SUBBASE AND BASE COURSES

A. Place subbase course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course under pavements and walks as follows:
   1. Compact subbase 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 D 698.

C. Synthetic Grass Surfacing Aggregate Subbase: Installation of the aggregate base should provide a close, evenly textured surface meeting the required tolerances.
   1. Only as required for replacement of existing base materials not suitable for new surfacing.
   2. Construction: Extreme care should be taken to ensure that there is no disturbance to the subgrade and that there is no displacement of the soil separator. All disturbed, displaced, or damaged material is to be repaired or replaced.
   3. Placement: The aggregate base should be placed in a manner that will produce an evenly graded mass to the depth specified. The material should be constructed in two lifts not over six (6) inches in depth when compacting across the entire field area when spread by appropriate equipment and methods, and should be thoroughly and uniformly compacted with a self-propelled roller to achieve the specified density. The material should be placed and distributed so that there will be no pockets of uniform size solid material. Any pockets resulting from segregation of the stone during installation should be reworked.
   4. Compaction, ASTM D698 or D2922: The field base materials should be thoroughly compacted to prevent any significant differential settlement across the area of synthetic turf surfacing. Typical minimum compaction levels are 95 percent Standard Proctor for the base materials. The appropriate moisture content must be maintained in the base materials to allow for optimal levels of compaction.
   5. Finish-Grade Planarity (surface tolerances) ASTM F2157: Irregularities in the surface of the base materials are typically reflected in the finished field surface. Therefore it is important to install the base materials to controlled tolerances. The local deviation of the finished surface of the base stone should not exceed 1/4 inch in any direction when measured beneath a 10 foot long straight edge. Hollows and depressions, which may have developed during the process of compacting the base, should be filled with acceptable material and re-compacted. The use of laser guided and controlled equipment will be required to maintain planarity. Documentation should be provided showing compliance with planarity requirements. The Synthetic Grass Surfacing Manufacturer shall review and approve the subbase installation before commencing installation of Synthetic Grass Surfacing.

3.19 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
   1. Synthetic Field and Paved Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
   2. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.

D. If 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 to depth required; recompact and retest until specified compaction is obtained.

3.20 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.
   1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

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.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 20 00

DIVISION 32

EXTERIOR IMPROVEMENTS

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Cold Milling Pavement
   2. Hot-mix asphalt paving
   3. Running Track Paving
      a. Protective Membrane System; Petromat Enviro (Basis of Design)
   4. Hot-mix asphalt patching.
   5. Hot-mix asphalt paving overlay.
   6. Pavement-marking paint.

B. Related Sections:
   1. Division 31 Section "Site Clearing" for removal of existing improvements.
   2. Division 31 Section "Earth Moving" for aggregate subbase courses and for aggregate pavement shoulders.
   3. Division 32 Section "Concrete Paving Joint Sealants": for joint sealants and fillers at paving terminations.
   4. Division 32 Section "Tennis Court Surfacing": for new pavement marking

1.3 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

B. DOT: Department of Transportation.

1.4 SYSTEM DESCRIPTION

A. Provide hot mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specification of state or local DOT.

B. Special Conditions
   1. Pavement
      a. No Bituminous Mixtures shall contain slag, iron, iron oxide or any other ferrous mineral or ferrous material.
   2. Protection of work in place
      a. All paving work shall be always protected from construction traffic. All damaged work shall be replaced with no additional payment.

1.5 SUBMITTALS

A. Quality Assurance/Control Submittals:
   1. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
   2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
      a. Certification: Provide material certificates signed by the material producer and the Contractor, certifying that each mixture does not contain ferrous material or ferrous minerals of any kind.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the State Department of Transportation Standard Specifications for asphalt paving work, except where modified, changed or added to in this specification:
   1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

C. Pre-installation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
      a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
      b. Review condition of subgrade and preparatory work.
      c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
      d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
   1. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
   2. Slurry Coat: Comply with weather limitations in ASTM D 3910.
   3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
   4. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements, provide product by the manufacturers specified.

B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product. The “Substitution Request Form” and complete technical data for evaluation must accompany requests for A/E’s approval. All materials for evaluation must be received by the Project Manager and Specification Department at least 7 days prior to bid due date. Additional approved manufacturers will be issued by Addendum.

2.2 COMPACTED AGGREGATE BASE MATERIAL

A. Compacted aggregate base for all pavement types shall consist of natural aggregate. The aggregate shall contain 95 to 100 percent crushed content.
   1. Provide crushed limestone. Class B or higher aggregates shall be used in all cases.
   2. Compacted aggregate base material shall conform to the gradation shown in the table for each class of paving.
   3. All compacted aggregate for bituminous paving shall be constructed in two lifts. In no case shall compacted aggregate lifts be thicker than 4 inches.
   4. Compacted aggregate shall contain 0% soft particles, 0% shale, 0%ferrouos material and 0 percent flat elongated particles.

2.3 MATERIAL GRADATIONS (Percent Passing is shown):

SIEVE SIZE mm (US Sieve)	PARKING AND DRIVES SURFACE COURSE	RUNNING TRACK TENNIS COURT SURFACE	BINDER COURSE	BASE COURSE	COMPACTED AGGREGATE
37.5 (1 ½)				100	100
25.0 (1)			100	80-99	80-100
19.0 (3/4)		100	80-98	67-90	70-90
12.5 (1/2)	100	76-96	56-80	42-74	55-80
9.5 (3/8)	85-98	62-84	43-68	33-60	45-70
4.75 (No. 4)	57-67	47-57	30-40	25-35	35-60
2.36 (No. 8)	31-62	26-56	14-40	12-34	25-50
1.18 (No. 16)	17-50	14-46	8-32	7-28	---
600mm (No. 30)	8-37	6-34	5-24	4-22	12-30
300mm (No. 50)	3-25	2-22	2-16	1-16	---
150mm (No. 100)	0-14	0-14	0-10	0-10	---
75mm (No. 200)	0-3	0-3	0-3	0-3	5-10
% Bitumen	5.5-7.0	5.0-6.4	4.1-5.2	4.0-5.1	N/A

2.4 PAVING MATERIALS

A. General: Use locally available materials and gradations, which exhibit a satisfactory record of previous installations.

B. Mineral Filler: Limestone dust, Portland cement, or other inert material complying with State Department of Transportation Standard Specifications.

C. Asphalt Cement: Use Performance Grade liquid asphalt's in accordance with State Department of Transportation Standard Specifications.

D. Tack Coat: ASTM D977, emulsified asphalt or ASTM D2397, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Tack Coat for use with Petromat, uncut paving grade asphalt cement.

F. Fabric: As specified on the Drawings.

G. Protective Membrane System: Nonwoven polypropylene fabric and asphalt cement complying with AASHTO M-288-00. Subject to compliance with requirements, provide one of the following products:
   1. Petromat Enviro; Propex Operating Company LLC, Chattanooga TN (BASIS OF DESIGN)

2. Petromat No. 4598; Amoco Fabrics and Fibers Company, Austell, Georgia.
3. Mirapave; TC Mirafi, Norcross, Georgia.
4. 461 Pavedry; SI Geosolutions, Chattanooga, Tennessee.

2.5 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

B. Joint Sealant: ASTM D 6690 or AASHTO M 324, Type II or III, hot-applied, single-component, polymer-modified bituminous sealant.

2.6 MIXES

A. All mix design parameters shall be measured in accordance and comply with State Department of Transportation Standard Specifications

1.	VMA%	15
2.	Air Voids %	3.5
3.	Fines/Binder Ratio	1.2
4.	Fine Aggregate Angularity	3
5.	Flow (mm)	2.0 – 4.0
6.	L.A. Abrasion Loss	40
7.	Soft Particle Max.	8
8.	Stability Min.	4.0 kN

2.7 RECYCLED ASPHALT PAVEMENT

A. Recycled asphalt pavement may be used in bituminous base ONLY provided the recycled asphalt does not contain objectionable material, ferrous material or materials that are not compatible with paints, coatings or other pavement markings, and do not exceed DOT recommended percentages.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 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 indicated on plans and details.
   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, 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. Transport milled hot-mix asphalt to asphalt recycling facility.
   7. Keep milled pavement surface free of loose material and dust.

3.3 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Re-compact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.4 INSTALLATION OF COMPACTED AGGREGATE BASE

A. The entire area to receive compacted aggregate shall be proof rolled with a tandem dump truck loaded with approximately 15 tons. The proof rolling shall be executed prior to installing the compacted aggregate. All soft and yielding areas shall be repaired.
   1. The acceptable observed subgrade deflection shall be 1/2 inch or less measured at the rear tire.

B. Compacted aggregate shall be installed immediately after acceptance of the subgrade proof roll operation by the soils engineer and Architect.
   1. The subgrade shall be repaired and the proof roll operation repeated in the event the approved subgrade is disturbed by construction traffic, rain or other circumstance prior to placing the compacted aggregate.
   2. The proof roll operation shall be repeated in the event the subgrade is left exposed for 3 work days or more prior to placing the compacted aggregate.

C. Place the aggregate material in accordance with applicable sections of the State Department of Transportation Standard Specifications and as hereinafter specified.

D. Aggregate material shall be compacted to thickness indicated on the Drawings. Each lift shall be compacted with approved rollers to no less than 100 percent of the maximum dry density as determined by Method C of AASHTO T99, as modified in Article 2.03.24.

E. All compacted aggregates for all bituminous pavements shall be installed in 2 lifts.

F. Grade Control: During construction maintain lines and grades, including crown and cross-slope of compacted aggregate course.

3.5 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared aggregate base is ready to receive paving.

3.6 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to 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 minimum temperature of 250 deg F (121 deg C).
   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 (3 m) wide unless infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

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.

D. Special Conditions
   1. Fenced areas: Paving in areas of fencing shall be completed prior to fence fabric or panels being installed.
   2. The paving machine shall not be allowed to track over or back track over any finished course of freshly placed bituminous mixture while the mixture is still hot or warm. Tracking the paving machine over freshly placed bituminous courses shall render that section of pavement unacceptable. All unacceptable pavements shall be removed and replaced with no additional payment.

3.7 PROTECTIVE MEMBRANE SYSTEM

A. Install protective membrane system in accordance with the approved manufacturer guidelines.

B. Asphalt tackifier to meet protective membrane manufacturer requirements.

C. Saw cut depth of finish pavement to be in accordance with the protect membrane manufacturer guidelines.

3.8 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 (150 mm).
   3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
   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 according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.

6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.9 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 (85 deg C).

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: 96 percent of reference laboratory density according to ASTM D 6927 or AASHTO T 245, but not less than 94 percent nor greater than 100 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. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base Course: Plus or minus 1/4 inch (6 mm).
   2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
   1. Base Course: 1/4 inch (6 mm).
   2. Surface Course: 1/8 inch (3 mm).

3.11 PAVEMENT MARKINGS

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to age for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose materials and dust.

D. Apply paint with mechanical equipment to produce pavement markings. Of dimensions indicated, with uniform, straight edges. Apply at manufacturer’s recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

E. Apply line markings primer, after masking tape has been laid to seal voids between masking tape and tennis court surface to prevent bleed-under when line paint is applied.

F. Apply a minimum of 2 coat of line paint in accordance with manufacturer's instructions.

G. Tennis Court Pavement Surfacing and Markings
   1. Division 32 Section "Tennis Court Surfacing": for new pavement surfacing and marking

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
   1. Compacted thickness shall not be less than indicated.

C. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness, using a 10-foot straightedge applied parallel with, and at right angles to, centerline of paved area. Surfaces will not be accepted if exceeding the following tolerances for smoothness:
   1. Binder Course: 1/4 inch.
   2. Surface Course: 1/8 inch.
   3. Check surface areas at intervals as directed by the Architect.

D. Flood Test
   1. Schedule: After the pavement is complete, perform a flood test in the presence of the Architect or Construction Manager.
   2. Method: Perform the flooding by use of water tank truck or available water.
   3. If depressions exist where water is ponding to a depth of more than 1/8 inch, fill with fresh hot asphalt concrete to provide proper drainage. Feather and smooth the edges of fill so that the joint to original surface is not visible.

E. Test un-compacted asphalt concrete mix and report the following:
   1. Sampling: AASHTO T168 (ASTM D979).
   2. Asphalt Cement Content: AASHTO T164 (ASTM D2172).
   3. Perform at least one initial test for paving, unless otherwise specified or directed.

F. In-Place Density: Testing agency will take samples of un-compacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.
   1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
   2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
      a. One core sample will be taken for every 500 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
      b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

G. Replace and compact hot-mix asphalt where core tests were taken.

H. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.13 FINAL ACCEPTANCE CRITERIA PAVING

A. Final acceptance for heavy duty and standard duty paving shall be based on asphalt coring within the test area limits as shown on the Drawings. Arrange for and execute core sampling by an independent testing agency. The cost of this testing shall be included in the bid by Contractor.

B. Core Requirements
   1. Cores shall be a minimum of 2 inches in diameter and 8 inches in depth.
   2. Cores shall be taken at a rate of 1 core every 3000 sq.yds. for each pavement type in each test area. In any case, no less than 4 cores shall be taken in each test area for each type of pavement.
   3. The location of the cores shall be at painted lines and as determined by the Engineer and marked on the Drawings after the surface course has been constructed.
   4. The total thickness of the surface plus the binder course for each core shall be determined. The total thickness of the compacted aggregate base for each core shall be measured and recorded.
   5. The average thickness of each aggregate course for each pavement type shall be determined and recorded for each test area. The average thickness of the surface course plus the binder course shall be determined and recorded for each test area.
   6. Voids created as a result of the coring shall be filled using concrete, mortar or other bituminous material as directed.

C. Acceptance Criteria
   1. The thickness of each asphalt course as shown on the Drawings is the compacted minimum not an average. If the average thickness of any asphalt or aggregate course is less than that shown on the Drawings, then the entire test area shall be resurfaced using a bituminous surface mixture with appropriate aggregate size to obtain 90 pound per square yard yield without breaking or scratching the aggregate.
   2. If the average thickness of the surface plus the binder or the average thickness of the compacted aggregate equals or exceeds the required thickness and if any course in any individual core is less than that shown on the Drawings then, at the discretion of the Engineer, that portion of the test area shall be resurfaced using 90 pound per square yard bituminous surface. Areas requiring resurfacing due to inadequate core samples shall not be less than 2400 square feet.
   3. No asphalt materials shall be removed to correct insufficient compacted aggregate once the binder or surface has been placed. The only acceptable corrective measure for insufficient compacted aggregate is additional bituminous material. Substantially insufficient compacted aggregate shall be corrected by additional resurface work constructed at a rate of 1 compacted inch of asphalt for every 2 inches of insufficient aggregate.
   4. No additional payment will be made for additional construction necessary due to insufficient cores.

D. Acceptance Submittals
   1. No bituminous pavements will be accepted until it has been demonstrated by the Contractor that the pavements are in accordance with the Drawings and Specifications. The Contractor shall submit the following:
      a. Pavement coring report with a drawing illustrating the location of each core taken, asphalt and aggregate thicknesses and subgrade moisture content.
      b. Modified proctor maximum dry density soil data for each soil type used as subgrade within the pavement. The soils data sheet(s) shall indicate which asphalt core or cores the soil corresponds to.
      c. Job mix formula for each type of bituminous mixture. The job mix formula shall contain, at minimum, the aggregate gradation, percent bitumen, source and type of bitumen and the laboratory maximum compacted density for the mixture.
      d. In-place asphalt compaction density test results illustrating the corresponding core to which the test applies.

E. Variation from Job Mix Formula or Required Gradations:
   1. Compliance Criteria
      a. Paving work shall be considered in compliance if the gradations and % bitumen noted in the table are within the specified ranges. No contract adjustments shall be made for all work that is in compliance with these specifications.
   2. Substantial Compliance Criteria
      a. Paving work shall be considered within substantial compliance if the gradations and percent bitumen noted in the table are within plus or minus 0.20

b. A deduct contract adjustment shall be made at the rate of $0.50 per square yard for each square yard of paving that varies from the Job Mix Formula or the Required Gradations.

3. Non-Compliance: Paving work shall be considered non-compliant if the gradations and percent bitumen deviate greater than 0.20 of the values in the table.

3.14 DISPOSAL

A. Remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow milled materials to accumulate on-site.

END OF SECTION 321216

SECTION 32 13 13 – SITE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes exterior cement concrete for the following:
   1. Curbs
   2. Slabs on grade
   3. Corner monuments

B. Related Sections include the following:
   1. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
   2. Division 32 Section "Concrete Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

A. Quality Assurance/Control Submittals:
   1. Product Data: For each type of manufactured material and product indicated.
   2. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   3. Qualification Data: For manufacturer and testing agency.
   4. Field quality-control test reports.
   5. Minutes of pre-installation conference.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete producer.
    d. Concrete pavement subcontractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement, when applicable.

B. Collect unused reinforcing steel and place in designated area for recycling.

1.7 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
    1. Products: Subject to compliance with requirements, provide one of the products specified.
    2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product. Requests for A/E's approval must be accompanied by the Substitution Request Form" and complete technical data for evaluation. All materials for evaluation must be received by the Project Manager and Specification Department at least 10 days prior to bid due date. Additional approved manufacturers will be issued by Addendum.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
    1. Use flexible or curved forms for curves with a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

D. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.

E. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

F. Plain Steel Wire: ASTM A 82, as drawn.

G. Deformed-Steel Wire: ASTM A 496.

H. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

I. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

J. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

K. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
   1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

L. Zinc Repair Material: ASTM A 780.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:
   a. Portland Cement: ASTM C 150, Type I or III,gray

B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.
   1. Maximum Coarse-Aggregate Size: 1 inch nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
   1. Products:
      a. Axim Concrete Technologies; Cimfilm.
      b. Burke by Edeco; BurkeFilm.
      c. ChemMasters; Spray-Film.
      d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
      e. Dayton Superior Corporation; Sure Film.
      f. Euclid Chemical Company (The); Eucobar.
      g. Kaufman Products, Inc.; Vapor Aid.
      h. Lambert Corporation; Lambco Skin.
      i. L&M Construction Chemicals, Inc.; E-Con.
      j. MBT Protection and Repair, ChemRex Inc.; Confilm.
      k. Meadows, W. R., Inc.; Sealtight Evapre.
      l. Metalcrete Industries; Waterhold.
      m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
      n. Sika Corporation, Inc.; SikaFilm.
      o. Symons Corporation; Finishing Aid.
      p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
   1. Products:
      a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
      b. Burke by Edoko; Aqua Resin Cure.
      c. ChemMasters; Safe-Cure Clear.
      d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
      e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
      f. Euclid Chemical Company (The); Kurez DR VOX.
      g. Kaufman Products, Inc.; Thinfilm 420.
      h. Lambert Corporation; Aqua Kure-Clear.
      i. L&M Construction Chemicals, Inc.; L&M Cure R.
      j. Meadows, W. R., Inc.; 1100 Clear.
      k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
      l. Symons Corporation; Resi-Chem Clear.
      m. Tamms Industries Inc.; Horncure WB 30.
      n. Unitex; Hydro Cure 309.
      o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:
   1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Penetrating Anti-Spalling Sealer: Sealer shall be a siloxane-based compound which has a 92 percent chloride ion screen and a repellency factor of 92 percent when tested in accordance with NCHRP #244, Test Method. In addition, sealer-treated concrete must exhibit no scaling when exposed to 125 cycles of freezing and thawing. System shall conform to requirements with ASTM C957-81. Tests must be by an independent testing laboratory.
   1. Products: Subject to compliance with requirements, provide products by one of the following:
      a. Euco-Guard Vox (VOC Compliant); Euclid Chemical Co.
      b. Environseal; Hydrozo.
      c. Saltguard WB; PROSOCO, Inc.
      d. Aquapel Plus; L & M Construction Chemical Co.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:
   1. Compressive Strength (28 Days): Refer to Concrete Schedule.
   2. Maximum Water-Cementitious Materials Ratio at Point of Placement: Refer to Concrete Schedule.
   3. Slump Limit: 4 inches, plus or minus 1 inch.

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: 6 percent plus or minus 1.5 percent for 1-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing admixture, high-range, water-reducing admixture, high-range, water-reducing and retarding admixture, plasticizing and retarding admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements as follows:
   1. Fly Ash or Pozzolan: 25 percent.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete, unless otherwise noted: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.
   1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
   1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
   2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
   3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earth Moving."

C. Proceed with concrete operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

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 for pavement 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 STEEL REINFORCEMENT

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

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
   1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
   1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
   2. Provide tie bars at sides of pavement strips where indicated.
   3. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

4. 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.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. Locate expansion joints at intervals not to exceed 50 feet or as noted on plans.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

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, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 3/8-inch radius. Repeat grooving of contraction joints after applying surface finishes to provide a “tooled and traced” or “window pane” appearance, unless otherwise noted. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Saw cut Contraction joints in concrete surfaces to receive synthetic track surfacing only.

E. Edging: Tool edges of pavement, curbs, and joints in concrete after initial floating with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. 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.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. 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.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Screed surfaces with a straightedge and strike off.

J. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

K. Curbs: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

L. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

M. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

N. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
   3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water 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.
   2. Coarse to Medium Textured broom Finish: For concrete surfaces to receive synthetic track surface draw a soft bristle broom across float finished concrete surface perpendicular to line of traffic to provide medium to coarse line texture to aid in adhesion of synthetic track surface. Do not seal concrete surfaces to receive synthetic track surfaces.

3.8 FORMWORK

A. General: See section 033000 for formwork and finishing of vertical exposed surfaces. Final surfaces shall have a smooth rubbed finish.

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 moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
   1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

F. Apply anti-spalling sealer to concrete surfaces to be left exposed per Manufacturer’s installation instructions and recommendations. Do not apply sealers to concrete surfaces to receive synthetic track surfaces.

3.10 CONCRETE TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:
   1. Elevation: 1/4 inch.
   2. Thickness: Plus 3/8 inch, minus 1/4 inch.
   3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
   4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
   5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
   6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
   7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
   8. Joint Spacing: 3 inches.
   9. Contraction Joint Depth: Plus 1/4 inch, no minus.
   10. Joint Width: Plus 1/8 inch, no minus.

3.11 FIELD QUALITY CONTROL

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

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.12 REPAIRS AND PROTECTION

A. Remove and replace concrete that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from concrete for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

SECTION 32 13 13.01 - CONCRETE SCHEDULE

SUBMIT THIS SCHEDULE TO CONCRETE SUPPLIER PRIOR TO BIDDING		
ITEM OR STRUCTURE	FINISH**	COMPRESSIVE STRENGTH AND OTHER REQUIREMENTS
Exterior walks, stoops, steps, aprons, and curbs; exterior formed concrete exposed to view; exterior concrete not otherwise indicated	NsBrm-Fn	4500 P.S.I. at 28 days air entrainment* Max W/C Ratio = 0.45 Use mid-range water reducer
Exterior paving	NsBrm-Fn	4500 P.S.I. at 28 days air entrainment* Max W/C Ratio = 0.45
Flowable Fill – Type 1 Utility Trench Backfill	N/A	50-100 P.S.I. at 28 days Unconfined compression strength per ASTM D4832
Flowable Fill – Type 2 Under Foundations	N/A	100 P.S.I. at 28 days Unconfined compression strength per ASTM D4832
Lean concrete fill under footings and encasement of underground utilities or connections	N/A	1500 P.S.I. at 28 days Max W/C Ratio = 0.55 for non-air entrained mix
Parking Bumpers	N/A	4500 P.S.I. at 28 days air entrainment* Max W/C Ratio = 0.45 Use mid-range water reducer

*Refer to Section 321313 – Concrete Paving for percent of air entrainment required for concrete mix and definitions of finishes..

Refer to Section 312000 – Earth Moving for additional requirements for flowable fill.

END OF SECTION 32 13 13.01

SECTION 32 13 73 - CONCRETE JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Expansion and contraction joints within cement concrete pavement.

1.3 SUBMITTALS

A. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

B. Quality Assurance/Control Submittals:
   1. Product Data: For each joint-sealant product indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.5 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
   2. When joint substrates are wet or covered with frost.
   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 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product. Requests for A/E's approval must be accompanied by the Substitution Request Form" and complete technical data for evaluation. All materials for evaluation must be received by the Project Manager and Specification Department at least 10 days prior to bid due date. Additional approved manufacturers will be issued by Addendum.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing 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.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 COLD-APPLIED JOINT SEALANTS

A. Multicomponent Sealant for Concrete: Pourable, chemically curing elastomeric formulation complying with the following requirements for formulation and with ASTM C 920 for type, grade, class, and uses indicated, provide one of the following:
   1. Urethane Formulation: Type M; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
      a. Products:
         1) Pecora Corporation; Urexpan NR-200.
         2) Sonneborn Building Products, Inc., Sonolastic SL2.
         3) Tremco Inc., Vullcem 245.
         4) Sika Corp., Sikaflex 2C SL.

B. Single-Component Urethane Sealant for Concrete: Single-component, pourable, coal-tar-modified, urethane formulation complying with ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
   1. Products:
      a. Sonneborn, Div. of ChemRex, Inc.; Sonolastic SL-1.
      b. Pecora Corp.; NR-201 Urexpan.
      c. Tremco Inc.; Vulkem 45.
      d. Sika Corp.; Sikaflex ICSL.

C. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.
   1. Products:
      a. Crafco Inc.; RoadSaver Silicone.
      b. Dow Corning Corporation; 888.

D. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
   1. Products:
      a. Crafco Inc.; RoadSaver Silicone SL.
      b. Dow Corning Corporation; 890-SL.

E. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.
   1. Products:
      a. Meadows, W. R., Inc.; Sof-Seal.

2.4 HOT-APPLIED JOINT SEALANTS

A. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.
   1. Products:
      a. Crafco Inc.; Superseal 444/777.
      b. Meadows, W. R., Inc.; Poly-Jet 3406.

B. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.
   1. Products:
      a. Koch Materials Company; Product No. 9005.

b. Koch Materials Company; Product No. 9030.
c. Meadows, W. R., Inc.; Sealtight Hi-Spec.

2.5 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.6 PRIMERS

A. Primers: Product 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
1. 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.

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.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials 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 backer materials.
2. Do not stretch, twist, puncture, or tear backer materials.
3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealants from surfaces adjacent to joint.
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.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved 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 and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 32 13 73

SECTION 321813 - SYNTHETIC GRASS SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section Includes:
   1. Synthetic grass infill system and accessories for Football field.
      a. New synthetic grass infill system on new base and subgrade.

C. Related Work:
   1. Division 31 Section “Site Clearing”: For removal of existing synthetic grass surface.
   2. Division 31 Section “Earth Moving”: For preparation of subgrade and field base materials.
   3. Division 33 Section “Sub-drainage”: For storm drainage structures and field drainage system.

1.2 DEFINITIONS

A. Terminology Definitions:
   1. Base Materials: Materials that provide porosity and stability such as crushed aggregate or porous pavement.
   2. Denier: The weight in grams of 9000 meters of fiber.
   3. Drainage System: A method of removing surface and subsurface moisture/water.
   4. Fiber: A specific form of fibrous textile material from which yarn is manufactured.
   5. Fiber Thickness: A measurement in microns (metric) or mils. (U.S.) of the thinnest cross section of a fiber.
   6. G-Max: A measurement of impact (shock absorption) in terms of gravity units as a ratio of deceleration.
   7. Infill: Loosely dispersed materials that are added to the synthetic turf system, typically sand, rubber, other suitable material, or a combination thereof.
   8. Knitted: A process in which the yard fibers of the pile are tied to the backing which was simultaneously constructed in the same over and under, crisscross process.
   9. Water Permeability: The rate at which water flows through a surface or system cross-section or components of the cross-section.
   10. Planarity: Uniformity of the surface as compared to certain fixed predetermined points or prescribed slopes.
   11. Primary Backing System: A single or multiple layers of woven or non-woven materials, into which the fiber is either tufted or knitted, to provide the initial construction of the synthetic turf.
   12. Secondary Backing System: A coating and/or woven or non-woven fabric layer(s) applied to the primary backing after the fiber pile has been locked into place which serves to provide tuft bind and additional structural integrity.
   13. Shock Absorbing System: Component(s) that add resiliency to the system.
   14. Subgrade: A stabilized foundation onto which the base materials and field systems are installed.
   15. Synthetic Pile Fiber: Grass-like blades made of synthetic materials.
   16. Tufted: A process by which the fiber yarns that form the pile are inserted into a previously prepared blanket-like primary backing.

1.3 PERFORMANCE REQUIREMENTS

A. General: Design of synthetic turf system is based on products and systems by manufacturers as specified in Part 2. Systems shall be engineered by manufacturer to provide a complete turf system.

B. Standard Test Methods: Systems shall comply with all applicable test standards as follows:

1. ASTM F 1551; “Standard Test Methods for Characterization of Synthetic Turf Playing Surfaces and Materials.”
    a. Suffix-DIN 18-035, Part 6 – Water Permeability of Synthetic Turf Systems and Permeable Bases.
    b. Suffix ASTM – Turf System Ball Bounce and Ball Rebound.
2. ASTM D-1682; Grab Strength Test
3. ASTM D-1335; Tuft bind
4. ASTM D-4158; Uniform Abrasion Method
5. ASTM F-1015; Relative Abrasiveness
6. ASTM F-355; Procedure A; Shock Absorbency
7. ASTM D-1876; Peel Resistance

C. Field Markings: Conform to requirements of the National Federation of State High School Association’s High School Track and Field Rules and Records.

D. Shock Absorbency: Field shall achieve a minimum of 130 Gmax Shock Absorbency at all tested locations and a maximum of 175.

E. Player-Surface Interface, ASTM F1936: The field surface should provide consistent footing across the entire field area in all directions. Footing includes traction, slip resistance, and rotational resistance. It should also allow for movement between the shoe and the field surface so that contact can be made between athletes without the foot locking into place.
1. Traction: The surface should provide good traction in all types of weather with the use of conventional athletic type shoes applicable to the sports and/or activity specified.
2. Rotational Resistance: The surface should allow for twisting movements as is common in athletic activities. Rotational resistance measures the ability of the user to perform twisting motions when in contact with the surface.
3. Slip Resistance Component: The system should enable a predictable range of movement between the user and the surface uniformly throughout. The surface should balance traction and slippage by way of the sliding coefficient.
4. Surface Abrasiveness: The field surface should have fibers that minimize skin abrasions.
5. Impact Absorption (force reduction): The field surface should have the ability to adequately absorb player impact with the surface.
6. Surface Stability (vertical deformation): The surface should provide adequate stability so that the athlete can maintain body control to help prevent or properly control contact between athletes. This is an important consideration that should be balanced with the surfaces’ ability to absorb impact. If the surface is too soft, the stability provided by the field may not be optimal for player movement and body control.

F. Ball-Surface Interface, ASTM F1936: The field surface should provide consistent and predictable ball performance reaction characteristics.
1. Surface Uniformity: The synthetic turf playing field should be as level as practical. The synthetic surface shall provide a true and uniform playing surface throughout.
2. Ball Bounce: The synthetic turf field should provide a ball bounce as close to the optimal playing characteristics of the sport or sports. The published standards for the regulatory organizations as applicable for each sport should be referenced.
3. Ball Roll: The synthetic turf field should provide a ball roll as close to optimal playing characteristics of the intended sport or sports. The published standards for the regulatory organizations as may be applicable for each sport should be referenced.

G. Appearance: Unless otherwise dictated by design, the synthetic turf should have a consistent color and shade without significantly noticeable streaks or other irregularities when observed in any direction.

1.4 SUBMITTALS

A. Shop Drawings: Prepare at scale of the construction documents and contain all pertinent information regarding installation. Drawings shall include the following:
1. Seaming plan; seams of pad are not to coincide with seams of synthetic turf or interfere with subsurface drainage system.
2. Installation details; edge detail, goal post detail, other inserts, etc.

3. Striping plan; layouts for football and soccer showing any field lines, markings and boundaries, and field logos as indicated.

B. Samples for Verification: Synthetic Turf, 30 inches by 30 inches with two 4 inch by 12 inch lines, (1 white and 1 yellow), installed per manufacturers recommended method.
   1. Color samples of A/E selected colors to match School colors.

C. Product Quality Assurance/Control Submittals:
   1. Product Data: For each type of product indicated.
   2. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency for turf system performance.
      a. Compliance with Pile Height, Face Weight and Total Fabric Weight per ASTM D418.
      b. Primary and Secondary Backing Weights per ASTM Dd418.
      c. Tuft Bind per ASTM D1335.
      d. Grab Tear Strength per ASTM D1682.
   3. Certification of Sub-base, drainage system and aggregate base installation: Manufacturer/installer shall certify acceptance of sub-base, storm drainage system and aggregate base for the purpose of obtaining manufacturer's warranty for the finished synthetic playing surface.
   4. Certification of Installer: Proof of compliance with "Quality Assurance" provisions.
   5. Warranty: Manufacturer's warranty with provisions specified herein that will be utilized for the Project. Generic warranties are not acceptable.

D. Closeout Submittals:
   1. Maintenance Data: For the proper care and preventative maintenance of the synthetic turf system, including painting and striping.
   2. Warranties: Special Warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Manufacturer/Installer's
   1. The synthetic turf installer/manufacturer shall demonstrate experience with at least 3 similar projects with contract amounts over $1,500,000.00. Submit information with the bid.
   2. The installer/manufacturer shall employ only qualified, experienced supervisors and technicians skilled in the installation of this system. All turf technicians shall be full time statutory employees of the turf manufacturer/installer. Submit resumes of the top 5 technicians and 2 supervisors with the bid.
   3. The turf installer/manufacturer must provide competent workmen skilled in this specific type of synthetic grass installation. The designated supervisory personnel on the project must be certified in writing by the turf manufacturer as competent in the installation of this material, including seaming and proper installation of the infill mixture. The manufacturer shall have a representative on site to certify the installation and warranty compliance.
   4. The manufacturer's representative and installation project manager shall observe establishment of subgrade, drainage system, and perimeter drain at periodic intervals during construction and notify the Architect of any items observed that may be detrimental to final installation of the synthetic turf.
   5. The Manufacturer must be a certified member of the Synthetic Turf Council (STC).
   6. Have proper license, in good standing, and have never had a license revoked.
   7. Have not been disqualified or barred from performing work for any public Owner or other contracting entity.
   8. Identify the foreman, supervisor and crew experience for the team executing this project installation. Include a list of completed projects in the last three (3) years by this specified team.
   9. Contractor to provide independent laboratory testing data, such as Lisport testing or similar, to substantiate the comparative durability of the proposed synthetic system the other competing systems that may be offered for the Owner's consideration.
   10. Provide documentation of sources of infill materials. Local and regional sources are encouraged whenever possible.

11. Impact testing: The contractor shall engage a third-party testing agency to perform GMAZ testing at substantial completion. No fewer than eight (8) locations on field shall be collected to compile a diverse, random assessment of the field. The intent of testing is to document newly constructed conditions for analysis and benchmarking in subsequent years. Initial construction is not anticipated to exceed GMAX 175.

1.6 WARRANTY

A. Turf Warranty: Within base response, the Contractor shall provide an 10-year warranty for outdoor applications. The follow conditions shall apply, when applicable:
   1. Coverage shall be for the full system, including drainage function, UV degradation, and fiber strength / stability of the backing, tufted yarn and seam integrity, base construction, and all other related components of the synthetic turf system.
   2. Provide a third party warranty covering the full system, including drainage function, UV degradation, and fiber strength / stability of the backing, tufted yarn and seam integrity, base construction, and all other related components of the synthetic turf system.

B. Manufacturer's Warranty: Manufacturer shall warrant artificial grass against defects in the material provided, including ultraviolet degradation, excessive fading, wrinkling, panel movement, shock absorbency, etc.
   1. The warranty submitted must have the following provisions even if not part of Manufacturer's standard Warranty form.
      a. Warranty Period: Eight (8) years from date of Substantial Completion.
      b. Warranty shall include materials and workmanship.
      c. Must have a provision to either make a cash refund or repair or replace such portions of the installed materials that are no longer serviceable to maintain a serviceable and playable surface.
      d. Must be a warranty from a single source covering workmanship and all self-manufactured or procured materials for the field surface and installation.
      e. Warrant that the yarn used to make the grass-like tufts will maintain its UV stability and tensile strength such that the strength of the fiber when measured in accordance with ASTM D-2256 will not decrease by more than 50% during the warranty period due to breakdown of UV stability.
      f. All warranties shall be in writing and remain valid should the manufacturer be acquired by another company prior to the conclusion of said warranty.

C. Attic Stock: Provide the Owner with a palette of crumb rubber "attic stock" material (2,000 lbs in either 50 lbs individual-wrapped bags or a single oversized bag) at the conclusion of the project for their future use. Ensure the material is an exact match to the approved and installed rubber ballast on the field.

1.7 MAINTENANCE SERVICE

A. Maintenance Proposal: Provide a separate maintenance proposal, not included in base bid, from manufacturer/installer to the Owner in a form of a standard one-year maintenance agreement. State the services to be provided, obligations, conditions and terms for agreement period and for future renewal options.

1.8 EXTRA MATERIALS

A. Furnish one additional standard infill container with rubber infill for the owners use. Container shall contain a min of 45 c.f. of rubber infill material.

B. Furnish roll of additional synthetic turf fabric for owners use. Roll shall contain a min. of 2000 s.f of turf fabric.
   1. All salvageable pieces of colored turf used during the installation should be left with the Owner.

C. Maintenance Equipment:

1. FTMAG 7’ Tow Behind Magnet

PART 2 - PRODUCTS

2.1 MANUFACTURERS/PRODUCTS

A. Varsity Football Stadium - Manufacturer: Subject to compliance with requirements, provide products from.
   1. Sprinturf LLC , Predator series , 146 Fairchild st ste 150, Daniel Island, SC 29492
      a. Sales rep Contact : Randy Hammond, Midwest Regional Sales Manager, (765) 437-4385, 3909 Sugar Lane, Kokomo, IN 46902

B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product. Requests for Architect’s approval must be accompanied by the “Substitution Request Form” and complete technical data for evaluation. All materials for evaluation must be received by the Project Manager and Specification Department at least 10 days prior to bid due date. Additional approved manufacturers will be issued by Addendum.
   1. With substitution request, manufacturer must submit all information in a matrix format that provides the same product information in the format of Article 3.7.

2.2 SYSTEM COMPONENTS

A. Drainage System, by Division 33, Section “Sub-drainage”.

B. Base Materials by Division 31, Section “Earthwork”

C. Materials: 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 in the area of the Project, be resistant to insect infestation, rot, fungus, and mildew; to ultra-violet light and heat degradation, and shall have the basic characteristic of flow-through drainage allowing free movement of surface run-off through turf where such water may flow to the sub-base and into the field drainage system.

D. Synthetic Turf System:
   1. Football Field (Basis of Design):
      a. Provide attic stock as describe within the ‘Warranties’ subsection.
      b. The synthetic turf surface should provide the performance characteristics, components and construction that meet the needs of the declared use for the playing field.
      c. Synthetic turf construction should provide a system that is resistant to weather, rot, mildew and fungus growth. The system components should be non-toxic, not cause commonly known allergic reactions, and conform to environmental requirements. Each synthetic turf system should be constructed to provide dimensional stability and resist damage from wear and tear during athletic and recreational usage. Each system should be resistant in it’s entirely to excessive ultraviolet degradation.
      d. Fibers for Tufted Systems: The polypropylene or polyethylene fiber should be of flat film, extruded or texturized slit film for football field.
      e. Primary Backing Systems: The primary backing materials should be either polyester tire cord, utilized in the knitting process, or a woven, non-woven, or other suitable materials in one or more layers, utilized in the tufting process.
      f. Secondary Backing Systems: The secondary backing materials should be applied through a coating process that can be single or multiple applications of one or several different materials. A knitted turf fabric should receive an initial acrylic coating followed by different options of polyurethane or suitable latex coatings in various weights and thickness configurations, depending on individual system design. A tufted turf fabric should receive a polyurethane or suitable latex pre-coat or a performance-based acceptable equal which than can be followed by an attached cushion or a laminated secondary backing utilizing polyurethane, suitable

latex, or an acceptable performance-based equal. The purpose of the secondary backing is to provide the desired level of tuft bind and structural integrity of the turf components. In cases where an increased level of system resilience is desired, multiple layers of secondary backing materials of different physical characteristics can be applied.

g. Water Permeability Rate: Permeable system by design with adequate drainage, perforations should be put through all of the backing coatings to provide for adequate drainage through the system as specified.

h. Seams: New synthetic turf materials are manufactured in panels or rolls that are usually 15 feet wide. Each panel or roll should be attached to the next with a seam to form the fabric of the field. Seams should be glued with a supplemental backing material or sewn with high strength sewing thread.

i. Adhesive: All adhesives used in bonding the system together should be resistant to moisture, bacterial and fungus attacks, meet local/regional environmental requirements and be resistant to ultraviolet rays at all locations within the installed system. The bonding or fastening of all system material components should provide a permanent, tight, secure, and hazard-free, athletic playing surface.

j. Seaming Tape: Seaming tape is commonly used for seams and/or inlaid lines and markings. The tape is comprised of a fabric that should be installed below the backing material on both sides of a seam or inlay. Adhesive is then applied to the seaming tape to provide a bond between adjacent turf panels to sections. The fabric used for seaming tape should provide dimensional strength and enough surface texture to bond well with the adhesive.

k. Turf Characteristics:
   1) Fiber Type: Apex Monofilament with SharkTooth Slit-film (basis of design)
   2) Fiber Microns: Apex Mono 380 microns, SharkTooth Slit-film 140 microns (basis of design)
   3) Yarn: UV-Resistant Polyethylene
   4) Turf Bind Strength: 8-10 lbs/force
   5) Face/Pile Yarn Weight: minimum of 50 oz/sq yd.
   6) Total Weight: minimum of 50 oz. , maximum of 55 oz.
   7) GMax Range: 130-165
   8) Base Bid: Infill materials with shock pad: Sand 4lbs and rubber 3lbs
   9) Pile Height: 2”
   10) Base Bid: 2 inch pile height with Schmitz ProPlay 20 shock pad
   11) Colors: Five minimum, manufacturer’s standard colors – lime green, forest green, lime green / forest green blend, blue, red, and white. Custom colors as required

E. Infill Material: Bas Bid - Infill materials are comprised of rubber 3 lbs and sand 4 lbs, there of which are placed on top of the synthetic turf backing and between the synthetic surface fibers.
   1. Sand: The sand material utilized as infill should be silt free, similarly sized, and rounded to sub-angular. The sand should be delivered to the site graded, washed and dried.
   2. Rubber: The rubber infill utilizes material that is either styrene butadiene rubber (SBR) or ethylene propylene dien polimerisat (EPDM) rubber granules. Both ambient and/or cryogenic rubber can be used.
   3. Hybrid: Constitutes the use of sand and rubber or other suitable materials in various combinations.

F. Lines, Markings, Logos or text: Construction and materials used should be harmonious with the synthetic surface.
   1. Installation: Lines, markings, logos or text shall be inlaid in the synthetic turf surface. Paint shall not be used unless otherwise approved by A/E.
   2. Color of inlaid lines, markings logos or text fabric shall be in colors as selected by the Owner / Architect from custom color selections, to match school colors. Any colors selected from custom colors shall be supplied at no additional cost to the owner.
      a. Refer to Drawings for field markings, lines, graphics, text and colors.
   3. Consistency: Synthetic turf and fibers utilized for the tufted or inlaid lines, markings, logos or text should be similar to that used in all other areas of the field and installed to the same tolerances.

G. Inserts: Covers for goal sleeves and anchors to synthetic turf.
   1. Consistency: The synthetic turf used for the inserts should be similar to that used in the area adjacent to the insert.
   2. Installation: The inserts should be anchored securely to the surrounding areas so that they cannot be displaced by the activities occurring on the field and installed to the same tolerances.

H. Nailer Strip: New Installation - The nailer strip shall be 2 inch by 4 inch treated “for ground contact” Southern Pine.

I. The entire synthetic turf system shall be “lead-free”.

J. FTMAG – 7’ Tow Behind Magnet:
   1. Basis of Design: FTMAG – 7’ Tow Behing Magnet and Accessories as Manufactured and/or Supplied by:
      a. Sportsfield Specialties, Inc.; P.S. Box 231, 41155 State Highway 10 Delhi, NY 13753, P. (888) 975 – 3343
   2. System to Include:
      a. Tow behind magnet system for system for synthetic infill turf
      b. Pull handles allow debris to be released from magnet
      c. Powder coated steel and aluminum construction
      d. Compatible with SweepRight Pro and GroomRight
      e. Approximate unit weight: 150lbs.
      f. Store inside when not in use

2.3 Synthetic Turf Underdrainage System

A. Furnish geo-textile covered perforated flat panel drains with all end caps, adapters, transitions and fittings required for a complete system.

B. Approved manufacturers:
   1. Hydraway, (800) 223-7015; 12” Hydraway 2000
   2. Advanced Drainage Systems, (800) 821-6710; Model AdvanEdge 12” (if available)
   3. Varicore Technologies, Inc., (800) 978-8007; Multi-Flow 12”
   4. JDR Enterprises, Inc., (800) 843-7569; J-Drain MVP 12”

C. Collector Drains: Utilize G-Series Plans. Include all associated fittings, transitions, end caps, adapters, couplers, outlets, and connectors.

D. Concrete Curb and Perimeter Nailer:
   1. Curb: 3,500 PSI, minimum
   2. Nailer: 2x4 composite wood or treated wood nailers appropriate for this application, fastened with tapcon or ramset every 24” on center.

2.4 Aggregate: A1 Stone Drainage Layer – Submit laboratory test providing a complete breakdown of the material and permeability prior to starting work.

A. Sieve Size : Percent Passing
   1. 1 ½” – 100%
   2. 1” – 95-100%
   3. ¾” – 80-100%
   4. ½” – 60-80%
   5. 3/8” – 30-50%
   6. #4 – 20-40%
   7. #8 – 10-30%
   8. #16 – 7-25%
   9. #40 – 5-17%
   10. #200 – 0-4%

2.5 Aggregate: A2 Washed Stone Chocker Layer – Minor adjustments to aggregate blends may be approved by the Owner with prudent testing data to support the deviation. Permeability must be greater than 16" per hour for the finished synthetic system. Submit laboratory test providing a complete breakdown of the material and permeability prior to starting the work.

A. Sieve Size : Percent Passing
1. ½" – 100%
2. 3/8" – 95-100%
3. #4 – 70-85%
4. #8 – 45-60%
5. #16 – 25-40%
6. #40 – 2-12%
7. #200 – 0-3%

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspection: Synthetic materials should be inspected prior to installation for:
1. Damaged or defective goods.
2. Missing goods or quantities.
3. Correct turf pile height.
4. Correct backing perforation diameter and spacing if applicable.
5. Materials out of tolerance with the specification.

3.2 GENERAL, INSTALLATION

A. The installation shall be performed in full compliance with shop drawings and manufacturer's printed instructions.

B. All installation operations shall be performed by personnel directly employed by the manufacturer, fully familiar with the materials and their application, under the full time direction and supervision of a qualified technical supervisor employed by the manufacturer of the synthetic turf.

3.3 INSTALLATION

A. Subgrade Preparation, refer to Division 31, Section "Earthwork": The subgrade should provide a stabilized foundation upon which base materials and subsequent components of playing field systems will be installed.
1. Subgrade (Rough) Planarity: The tolerances for the finished subgrade should not exceed one inch as measured by a 10 foot straight edge. Grading of the subgrade shall minimize ponding to the extent practical.

B. Aggregate refer to Division 31, "Earthwork": Installation of the aggregate base should provide a close, evenly textured surface meeting the required tolerances.

C. Nailer: Attach the treated nailer for the turf attachment to the trench drain footing and curbs by means of a galvanized 3/8 inch minimum bolt at 4 feet on center, minimum. The elevation of the nailer shall be determined by the turf manufacturer's specifications.

D. Synthetic Turf Installation: All synthetic turf systems should be installed to provide stability that will prevent panels from shifting or bunching.
1. Seaming Method: The synthetic turf panels should be securely fastened together for the warranted life of the system. These seams are typically glued or sewn, the method for which varies from system to system. Seam gaps should be uniform. For tufted infill systems the gap between the fibers should not exceed the gauge of the tufting. For other synthetic turf systems, the seam gaps should not exceed 1/16 inch.
a. Major panel seaming: Seams must be sewn. Seams shall be flat, tight and permanent with no separation or fraying.

b. Inlays shall be glued and warranted for workmanship per the Warranty Article.

2. Edge Anchoring: Tie anchor to trench drain. Provide a secure anchor.

E. Infill Material Installation: Correct installation is critical to performance of these systems and should follow the manufacturer's recommendations.

1. Environmental Conditions: It is recommended infill materials should be installed under dry field conditions.

2. Method of Application: The infill material should be installed uniformly. The equipment used for the application of the infill materials should erect the fiber, place the infill materials, and should incorporate a metering method to provide consistent distribution. The equipment utilized should not distort or displace any base materials or damage to system in any way.

a. Apply infill in numerous thin lifts using specialized broadcasting equipment

b. Infill material shall be installed to a depth of approximately 1.75 inches. A maximum of 0.75 inches of fiber can be exposed

c. Infill mixture can only be applied when dry

F. Fiber Conditioning: It is essential to maintain the integrity and uniformity of the fiber throughout the manufacturing, shipping and handling, installation and maintenance processes in order to prevent damage which could alter the specified performance and void the warranty.

3.4 FIELD MARKINGS

A. Installer shall install logos, numbers and additional markings as indicated in accordance with process indicated on shop drawings.

3.5 CLEANUP

A. Contractor shall provide the labor, supplies and equipment as necessary for final cleaning of surfaces and installed items.

B. All useable remnants of new material shall become the property of the Owner.

C. The Contractor shall keep the area clean throughout the project and clear of debris.

D. 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.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. G-Max Testing, ASTM F1936:

1. Temperature: Ambient shaded air temperature of 40 – 100 degrees Fahrenheit.

2. Number: 10 tests shall be conducts throughout each field area at completion of work. Test locations shall conform as closely as possible to the test sites specified in ASTM F1936 (Football) or FIFA Handbook 3-06 (Soccer).

a. Provide complete report of testing values and diagram of locations.

b. Acceptable industry manufacturer tolerance of +/- 2 percent.

c. Test results shall be between 130 and 175. If test results in values above 175, adjustments should be made to the installation and materials until test results are within the acceptable range.

3.7 DEMONSTRATION

A. The synthetic turf installer shall provide detailed written maintenance instructions, suggested guidelines for the system, and training of maintenance personnel. Maintenance of the systems typically consists of cleaning, stain removal, minor seam repair, dragging or redistribution of any infill material, and management of infill compaction. Specialized equipment is typically required for the maintenance of the surface and should be included with the field contract. Utilizing this equipment as recommended by the installation builder will generate the proper maintenance in relation to any future warranty claims.

3.8 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable infill, obstructions, demolished materials, and all waste materials including trash and debris, and legally dispose of them off Owner's property.
   1. Burning of combustibles, cleared and grubbed materials is not permitted on Owner's property

3.9 MANUFACTURER / PRODUCT INFORMATION REQUIREMENTS

A. Manufacturer product characteristics and specifications shall be submitted for consideration by each contractor following bidding for consideration

END OF SECTION 321813

SECTION 32 18 25 - SYNTHETIC TRACK RESURFACING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Rehab of existing Polyurethane track system
B. New Polyurethane track system
C. The synthetic surfacing contractor shall furnish all labor, materials, equipment, supervision, and services necessary for the proper completion of the Synthetic Track Surfacing System and related work indicated on the drawings and specified herein.

D. The synthetic surfacing contractor shall refer to the drawings for the required locations of synthetic track surfacing to be installed. All quantities and dimensions shall be field verified by the synthetic surfacing contractor.

1.3 SPECIFIC SCOPE OF WORK

A. Install an IAAF approved, impermeable polyurethane synthetic track system consisting of SBR Rubber, single-component polyurethane binder and a poured-in-place, two-component U.V. stabilized elastomeric polyurethane wearing layer with an embedded textured finish.

B. Layout and paint all track lines and event markings as required and specified by current NFHS, IAAF and NCAA rules.

1.4 COORDINATION

A. The synthetic surfacing contractor shall coordinate the work specified with an authorized and appointed representative of the owner to perform the work during a period and in a manner acceptable to the owner.

1.5 CODES AND STANDARDS

A. Applicable Publications
1. Codes and standards follow the current guidelines set forth by the National Federation of High School Associations (NFHS), International Amateur Athletic Federation (IAAF) and the National Collegiate Athletic Association (NCAA), along with the current material testing guidelines as published by the American Society of Testing and Materials (ASTM).

1.6 PERFORMANCE STANDARDS

A. The synthetic track surfacing system shall exhibit the following minimum performance standards as required by IAAF:

1.	Thickness:	(13mm) or as specified
2.	Force Reduction	35-50%
3.	Vertical Deformation:	0.6mm-2.5mm
4.	Coefficient of Friction	:≥ 0.5 (47 TRRL Scale)
5.	Tensile Strength:	≥ 0.5 Mpa
6.	Elongation:	≥ 40%A

1.7 QUALITY ASSURANCE

A. Contractor and Manufacturer Qualifications
   1. The CONTRACTOR and the MANUFACTURER must demonstrate working together on the successful completion of a minimum of 10 similar projects within the past 3 years.
   2. The CONTRACTOR must have a minimum of 7 years' experience in the installation of poured-in-place, two-component elastomeric polyurethane synthetic track surfacing.
   3. The CONTRACTOR shall be able to furnish evidence that they have been in business for a period of not less than 3 years, under the present name, and if required, furnish financial statements for each of the past 3 years.
   4. The CONTRACTOR must have installed a minimum of 6 outdoor track facilities in the last 2 years using the exact, IAAF certified, poured-in-place, two-component elastomeric polyurethane synthetic track surfacing, as specified herein with the contractor bidding this project.
   5. The MANUFACTURER must have a minimum of 10 years of experience with compound two-part polyurethane for athletic surfaces.
   6. The CONTRACTOR is required to provide documentation that shows the selected specified and installed product meets IAAF Performance Specification for Synthetic Surfaced Athletics Tracks (Outdoor) and is certified in terms of the IAAF certification system as updated to present day.
   7. CONTRACTOR is to provide a list of completed facilities, minimum of 10 which are certified to meet IAAF rules & regulations, utilizing the same product as specified.
   8. The MANUFACTURER must offer a minimum of four (4) IAAF Certified Track Systems.

1.8 SUBMITTALS

A. The following submittals must be received and approved prior to commencing work:
   1. Standard printed specifications of the synthetic track surfacing system to be installed on this project.
   2. 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.
   3. A synthetic track surfacing system sample, 6" x 6" in size, of the same synthetic track surfacing system to be installed on this project.
   4. An installation list of outdoor track facilities installed within the last two years, using the exact synthetic track surfacing system specified herein.
   5. Test results from an approved IAAF Testing Laboratory confirming compliance to the performance of athletic tracks test according to the IAAF.
   6. The contractor shall provide a lane marking plan for review and acceptance in writing by the owner prior to commencing painting operations.

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PART 2 - PRODUCTS

A. Impermeable polyurethane synthetic track system consisting of SBR Rubber, single-component polyurethane binder and a poured-in-place, two-component U.V. stabilized elastomeric polyurethane wearing layer with an embedded textured finish.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Advanced Polymer Technology, Harmony, PA – Spurtan BV (Basis of Design)
      b. Beynon Sports Surfaces, Inc. – BSS 300
      c. Stockmeier Urethanes, Clarksburg, WV

2.2 ELASTOMERIC POLYURETHANE

A. The two-component U.V. stabilized elastomeric polyurethane compounded from polyol and isocyanate components, based on one hundred percent (100%) Methylene Diphenyl Isocyanate (MDI). No Toluene Diisocyanate Isocyanate (TDI) will be allowed.

B. The elastomeric polyurethane shall be red in color.

2.3 EPDM GRANULATE

A. The EPDM granulates shall be approximately 1 to 3mm in size.

B. The EPDM granulates and the U.V. stabilized elastomeric polyurethane shall be color matched.

2.4 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.

2.5 SINGLE COMPONENT POLYURETHANE BINDER

A. Shall be 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.

2.6 SEAL COAT

A. Shall be a two-component polyurethane pore sealer use with paved rubber granule mats. The granular SBR and binder layer shall be sealed with the two-component polyurethane pore sealer. The application of EPDM dust is not allowed.

2.7 LINE MARKING PAINT

A. Single-component, moisture cured, aliphatic polyurethane paint.

2.8 INSTALLATION

A. Sub-base
   1. The Synthetic Track Surfacing System shall be laid on an approved sub-base. The Contractor shall prepare the sub-base asphalt through the complete removal of all existingsynthetic track surfacing and any other debris.
   2. The exposed sub-base asphalt shall be thoroughly cleaned of any debris or materials that may affect the adhesion and long-term performance of the new synthetic track surface.
   3. The contractor shall review the clean exposed sub-base of the asphalt with the owner's representative.
   4. Any concerns with the exposed sub-base asphalt are to be documented in writing by the contractor and acknowledged by the owner prior to commencing track surface installation.
   5. The clean exposed sub-base asphalt shall be prepared for the synthetic track surface.
      a. All surface preparation labor and materials are considered the responsibility of the contractor and incidental to the scope of work.
   6. No cold tar patching, skin patching or sand mix patching will be acceptable.
   7. Any oil spills (hydraulic, diesel, motor oil, etc.) must be completely removed, either by chipping out or removing and replacing with new, keyed in asphalt.
   8. It shall be the responsibility of the contractor to determine if the asphalt substrate meets all manufacturer and project criteria. After all the above conditions are met, the synthetic surfacing contractor must, in writing accept the asphalt receiving base before work can commence.

2.9 THICKNESS

A. The thickness of the Synthetic Track Surfacing System shall be 13mm.

2.10 EQUIPMENT

A. The Synthetic Track Surfacing System components shall be processed and installed by specially designed machinery and equipment. A mechanically operated paver with variable regulated speed and thermostatically controlled screed shall be used in the installation of the base mat. The wearing course shall be installed using automatic electronic portioning, which provides continuous mixing and feeding for an accurate, quality-controlled installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Base Course
1. The SBR granules and single-component polyurethane binder shall be mixed onsite to regulate the ratio/quantity of SBR, not to exceed 82% 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.

B. Seal Coat
1. The two polyurethane pore sealer components are to be mixed at the prescribed ratio homogeneously with a suitable mixing device. The coating is squeegee applied to the base mat, making it impermeable.

C. Wearing Course
1. The 1 to 3mm EPDM granules shall be integrated into the two-component U.V. stabilized elastomeric polyurethane compounded from polyol and isocyanate components 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.

3.2 SITE CONDITIONS

A. The contractor is to protect all existing site improvements from damage and over spray during all phases of the construction.

B. Installation shall not take place if adjacent or concurrent construction generates excessive dust, abrasives, or any other by-product that, in the opinion of the installer, would be harmful to the track material, until completion of such works.

C. 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. Required installation temperature is fifty degrees Fahrenheit and rising. Installation shall be executed only in dry conditions.

3.3 LINE STRIPING AND EVENT MARKINGS

A. Layout
1. Line striping and event markings shall be laid out in accordance with current NFHS, IAAF and NCAA rules.

3.4 CERTIFICATION

A. Upon completion of the installation, the owner shall be supplied with a survey and a letter of certification attesting to the accuracy of the track markings in meeting all NFHS and IAAF rules.

3.5 GUARANTEE

A. The Synthetic Track Surfacing System 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 because 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 32 18 25

SECTION 32 92 00 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Lawn renovation or replacement of bare or thin turf areas disturbed during football and track renovation work.

B. Related Sections:
   1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling and for soil erosion and sedimentation control that may affect the Work of this Section.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a fertile, friable loam with a range of 6 percent to 20 percent organic material content; free of stones 1/2 inch or larger in any dimension and other extraneous materials harmful to plant growth.

C. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath topsoil.

D. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

E. Lawn Maintenance: All materials and operations necessary to establish and maintain a healthy stand of turf following initial seeding operations. Including but not limited to, mowing, fertilization, watering and treatment for weeds, fungus and disease as needed. Maintenance remains responsibility of Contractor for a minimum of 60 days from acceptance.

1.4 SUBMITTALS

A. Quality Assurance/Control Submittals:
   1. Product Data: For each type of product indicated.
   2. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
   3. Qualification Data: For qualified landscape Installer.
   4. Product Certificates: For soil amendments and fertilizers from manufacturer.
   5. Material Test Reports: For existing surface soil and imported topsoil.
   6. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment. The submitting bidders shall be and have been actively engaged in seeding operations for a minimum of 4 years and shall provide proof of 5 of more successful seeding installations.
   1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; action exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
   1. Report suitability of topsoil for lawn growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil for establishment of lawns.

D. Seeds: Packages of seed shall bear official State or Federal stamps or certificates indicating type, quality, and content of seed packages. Deliver packages unopened. Do not open until observed by Architect/Engineer.

E. Requirements of Regulatory Agencies: Comply with all Federal and State laws governing fertilizers.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

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 fertilizers, lime, and soil amendments with appropriate certificates.

1.7 PROJECT CONDITIONS

A. Contractor shall notify A/E , in writing, when Work on this Project has progressed sufficiently to commence work of seeding. Thereafter, seeding operations shall be conducted under favorable weather conditions during next season or seasons, which are normal for such work as determined by accepted practice in locality of Project. At option and on full responsibility of Contractor, seeding operations may be conducted under unseasonable conditions without additional compensation.

1.8 SCHEDULING

A. Planting Restrictions: Plant during one of following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of seeding.
   1. Spring Planting: May 1, beginning date.
   2. Fall Planting: October 1, ending date.
   3. Summer Planting: June 15 through September 1, only when water is available.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.9 WARRANTY AND REPLACEMENT

A. Warranty: Lawns shall be warranted for minimum duration of one full year after seeding and shall be alive and in satisfactory growth at end of warranty period.

B. Replacement: At end of warranty period, A/E upon written notice requesting such inspection, submitted by Contractor at least 10 days before anticipated date, will make observation. If lawns do not show a healthy, uniform stand of grass, those areas shall be reseeded as soon as conditions permit, but during spring or fall seeding periods.

C. Architect/Engineer will observe seeded areas within one-year warranty. Seeded areas requiring replacement during warranty period shall be warranted one additional full year from date of reseeding.

D. Owner's Responsibility: If an area of seeding during warranty and replacement period is found to be damaged or destroyed due to vandalism, malicious mischief, vehicle ruts and tracks, or acts of God such as flooding, storm debris, then Owner will have responsibility of replacing those lawn areas without cost or responsibility to Contractor.

PART 2 - PRODUCTS

2.1 SEED

A. Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Lawn Grass Seed:

Dealer shall mix and warrant in accordance with the following:

50 percent of mixture shall contain 4 of following Kentucky Bluegrass varieties in equal proportions:

Nuglade, Award, Briliant, America, Unique, Apollo, Shamrock, Showase, Absolute, NJ-GD, SR-2109, Bartitia, Livingstton, ASP 200, Midnight, Eclipse, Nu Star, Limosine, Rambo, Coventry, and NJ-1190.

50 percent of mixture shall contain 2 of following perennial ryegrass varieties in equal proportions.

Brightstar II, Calypso II, Premier II, Monterey, Accent, Panther, LRF-94-C8, Sonata, Top Hat, CIS-MBH, Caddieshack, Laredo, Repell III, Brightstar, Wind Dance, Imagine, SR4400, Omni, and RS.

No substitutions will be accepted unless identical to specified mix and approved by Architect prior to bidding.

Grass seed shall be 95 percent pure and free of weeds and other harmful plants. It shall have a sufficient percentage of germination to provide a good stand of lawn within requirements of these Specifications, approximately 85 to 87 percent minimum.

C. General: Use any of the following soil amendments as recommended by “topsoil analysis” to produce topsoil suitable for lawn growth.

1. Lime: ASTM C 602, agricultural limestone containing a minimum of 80 percent calcium carbonate equivalent and as follows:
   a. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.
   b. Provide lime in form of dolomitic limestone.
2. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.
3. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
4. Aluminum Sulfate: Commercial grade, unadulterated.
5. Perlite: Horticultural perlite, soil amendment grade.
6. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.
7. Sand: Clean, washed, natural or manufactured, free of toxic materials.
8. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
9. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.2 FERTILIZER

A. Fertilizer: Commercial fertilizer shall be used for initial preparation and shall conform to applicable state fertilizer laws. Use of organic lawn fertilizer shall be used for surface application after grass is up. Fertilizer shall be uniform in composition, dry and free flowing, and shall be delivered to site in original, unopened containers, each bearing manufacturer's guaranteed analysis. Fertilizer, which becomes caked or otherwise damaged, making it unsuitable for use, will not be acceptable. 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.`

2.3 MULCHES

A. Wood Fiber Mulch: Shall not contain growth or germination – inhibiting factors and shall be dyed an appropriate color to facilitate placement during application. Mulch shall be Weyerhauser “Silva-Fiber” or equal, available from American Excelsior Corporation, Chicago, Illinois.

3.1 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.
   3. Examine finish grade for [roper elevation and notify the Architect/ Engineer of any areas detrimental to successful development of a lawn. Do not proceed with work until unsatisfactory conditions have been corrected and are acceptable

3.2 LAWN PREPARATION

A. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

B. Newly Graded and areas of temporary seeding: Till topsoil to a minimum depth of 4 inches. Remove stones larger than 1/2 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1. Apply fertilizer and soil amendments directly to topsoil before tilling, per specifications.
   2. Apply soil amendments and fertilizer on surface, and thoroughly blend into topsoil mix.
      a. Two pounds of 15-20-10 formula commercial starter fertilizer per cu. Yd. shall be thoroughly mixed with the topsoil or not less than 10 lbs. per 1000 sq. ft. of lawn surface, whichever is the greater.
      b. Lime shall be applied at the rate of 50 lbs. per 1000 sq. ft. or as indicated by soil tests to areas being prepared for planting. Mix lime with dry soil before mixing fertilizer.

C. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

3.3 SEEDING

A. Sow lawn seed mix with spreader or brillion seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
   1. Do not use wet seed or seed that is moldy or otherwise damaged.
   2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow lawn seed mix at a total rate of 8 lb/1000 sq. ft.

C. Rake seed lightly into top 1/8 inch of soil, roll with a 200 lb roller, and water with fine spray.

3.4 HYDROMULCHING

A. Hydromulching: Mix specified wood fiber mulch and tackifier in water, using equipment specifically designed for hydro mulch application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

B. Mulch: Hydromulch seeded areas at a min. rate of 1800 pounds per acre. Use Bowie hydromulcher or equal to apply mulch, unless otherwise noted. Hydromulch shall also be applied over erosion control blankets. “Hydroseeding” (combination of mulch, seed and fertilizer) will NOT be allowed. Hydromulching shall be a separate operation from seeding.

3.5 LAWN RENOVATION

A. Renovate existing lawn disturbed by construction activities.

B. Renovate existing lawn damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
   1. Reestablish lawn where settlement or washouts occur or where minor regrading is required.
   2. Provide new topsoil as required.

C. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.

D. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.

E. Mow, dethatch, core aerate, and rake existing lawn.

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 soil amendments and initial fertilizers required for establishing new lawns and mix thoroughly into top 4 inches of existing soil. Provide new planting soil to fill low spots and meet finish grades.

J. Apply seed and protect with hydromulch as required for new lawns.

K. Water newly planted areas and keep moist until new lawn is established.

3.6 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than following periods:
   1. Seeded Lawns: Maintenance remains responsibility of Contractor until Project close out or a minimum of 60 days.

B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, cultivation, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation. New lawn planting shall be protected and maintained until the end of lawn maintenance period.
   1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.

C. Watering: where an irrigation system is not available provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches. The owner eill furnish the water used to maintain the lawns as specified.
   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 lawn with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 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: Provide all labor and equipment for maintenance and mowing
   1. May – June Every 3-4 days
   2. July – Early August Every 5 days
   3. August – November Every 3-4 days

E. Fertilization: Apply fertilizer after initial mowing and when grass is dry. Continue fertilization through maintenance period in accordance with following rates and schedule:

LAWN				
Date	**Rate (lb. N/1000 ft2)**	**Fertilizer Ratio (N-P-K)**	**Examples to Purchase**	**Nitrogen Source**
May 1-10th	0.75	1-0-1	25 0-25 20-0-20	>50% soluble Nitrogen
June 1-10th	0.5	1-0-1	25-0-25 20-0-20	>50% soluble Nitrogen
July 1-6th	0.75	1-0-0	33-0-0 35-5-4	<35% soluble Nitrogen
September 5-10th	1	1-1-1	12-12-12 19-19-19	<35% soluble Nitrogen
November 5-15th	1	1-0-0	33-0-0 Sulfur coated urea	<35% soluble Nitrogen

3.7 SATISFACTORY LAWNS

A. Lawn installations shall meet the following criteria as determined by Architect:
   1. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm) and as acceptable to the Architect.

B. Use specified materials to reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.8 CLEANUP AND PROTECTION

A. Promptly remove soil and debris, created by lawn work, from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. 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 lawn is established.

C. Remove nondegradable erosion-control measures after grass establishment period.

3.9 FIELD QUALITY CONTROL

A. Architect will make observation of the Work of lawns to determine completion of Contract work at conclusion of maintenance period, upon written notice requesting such observation submitted by Contractor at least 10 days prior to anticipated date. Architect will note condition of lawns and determine in writing whether maintenance shall continue.

END OF SECTION 32 92 00

DIVISION 33

UTILITIES

SECTION 33 46 00 - SUBDRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes under-drain or sub-drainage systems for the following:
   1. Synthetic Grass surfacing Athletic field.

B. Related Sections include the following:
   1. Division 32 Section “Synthetic Grass surfacing” for synthetic grass infill turf system

1.2 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. HDPE: High-density polyethylene plastic.

C. PE: Polyethylene plastic.

D. PP: Polypropylene plastic.

E. PS: Polystyrene plastic.

F. PVC: Polyvinyl chloride plastic.

G. Sub-drainage: Drainage system that collects and removes subsurface or seepage water.

1.3 SUBMITTALS

A. Quality Assurance/Control Submittals:
   1. Product Data: For the following:
      a. Perforated-wall pipe and fittings.
      b. Solid-wall pipe and fittings.
      c. Drainage conduits.
      d. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

   Approved manufacturers:
   2. Hydraway, (800) 223-7015; 12” Hydraway Geocomposite Drainage system (Basis of Design)
   3. Advanced Drainage Systems, (800) 821-6710; Model AdvanEdge 12” (if available)
   4. Varicore Technologies, Inc., (800) 978-8007; Multi-Flow 12”
   5. JDR Enterprises, Inc., (800) 843-7569; J-Drain MVP 12”
   6.

2.2 PIPING MATERIALS

A. Refer to the "Piping Applications" Article in Part 3 for applications of pipe, tube, fitting, and joining materials.

2.3 PERFORATED-WALL PIPES AND FITTINGS

A. Perforated PE Pipe and Fittings:
   1. NPS 6 and Smaller: ASTM F 405 or AASHTO M 252, Type CP; corrugated, for coupled joints.

   2. NPS 8 and Larger: ASTM F 667; AASHTO M 252, Type CP; or AASHTO M 294, Type CP; corrugated; for coupled joints.
   3. Couplings: Manufacturer's standard, band type.

B. Perforated PVC Sewer Pipe and Fittings: ASTM D 2729, bell-and-spigot ends, for loose joints.

C. Flat pipe for athletic synthetic grass surfacing turf field underdrain: Flat pipe drain panels shall be 1x12" Hydraway Geocomposite Drainage system (Basis of design) as manufactured by Hydraway, 8250 Bunkum Rd, Caseyville, IL 62232, (800) 223-7015
   a. Sales Representative: Cory Spohn – Hydraway Sales/Product Manager, (800) 223-7015, cspohn@intechanchoring.com
   2. Only if required by poor condition of the existing substrate requiring replacement.
   3. Drainage System: The drainage system should provide sufficient drainage of the entire playing surface to meet local conditions.
   4. Components: The drainage system may include the synthetic turf, pad, base materials and collector pipes that collect and remove storm water from the playing field. The design of the drainage system is dependent upon local conditions, climates, and site constraints. The Rational Method, Hydrograph Analysis, or Time Series Method may be used to determine the rainfall runoff that must be accommodated by collector pipes.
   5. Site Conditions: Rainfall duration intensity curves can be developed from the National Weather Service Technical Paper TP-40 Rainfall Frequency Atlas for the United States or coordinated with the local weather statistics at the location of the project site. The design storm frequency should be as required by local regulations, where no local regulation exists a minimum 5 year design storm frequency is recommended for playing fields at grade. For fields requiring pump stations, a more conservative design frequency that is compatible with the design capacity of the pump station should be used.
   6. Flow Time: The time interval for water to flow through the complete system to the collector pipes is based on permeability tests conducted in the laboratory for the design of the complete system. Flow through the base material can be enhanced by the use of composite drainage materials or lateral drain pipes that intercept the normal flow of water in the complete system and flow directly to the collector pipes.

2.4 SOLID-WALL PIPES AND FITTINGS

A. PE Drainage Tubing and Fittings: AASHTO M 252, Type S, corrugated, with smooth waterway, for coupled joints.
   1. Couplings: AASHTO M 252, corrugated, band type, matching tubing and fittings.

B. PE Pipe and Fittings: AASHTO M 294, Type S, corrugated, with smooth waterway, for coupled joints.
   1. Couplings: AASHTO M 294, corrugated, band type, matching tubing and fittings.

C. PVC Sewer Pipe and Fittings: ASTM D 3034, SDR 35, bell-and-spigot ends, for gasketed joints.
   1. Gaskets: ASTM F 477, elastomeric seal.

2.5 SPECIAL PIPE COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground non pressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant metal tension band and tightening mechanism on each end.
   1. Sleeve Materials:
      a. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.

b. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2. Unshielded Flexible Couplings: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant metal tension band and tightening mechanism on each end.
3. Shielded Flexible Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant metal tension band and tightening mechanism on each end.

2.6 CLEANOUTS

A. PVC Cleanouts: ASTM D 3034, PVC cleanout threaded plug and threaded pipe hub.

B. Cast-Iron Cleanouts: ASME A112.36.2M; with round-flanged, cast-iron housing; and secured, scoriated, Medium-Duty Loading class, cast-iron cover. Include cast-iron ferrule and countersunk, brass cleanout plug.

2.7 SOIL MATERIALS

A. Backfill, drainage course, impervious fill, and satisfactory soil materials are specified in Division 31 Section "Earth Moving."

B. Drainage Fill: 1/2 to 3/4 inch open graded washed gravel.

2.8 GEOTEXTILE FILTER FABRICS

A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.
1. Structure Type: Nonwoven, needle-punched continuous filament or woven, monofilament or multifilament.
2. Style(s): Flat and sock.

B. Weed Control Barrier; Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric 4.8 oz./sq.yd.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas for suitable conditions where sub-drainage systems are to be installed.

B. Locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and damage of services.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.3 PIPING APPLICATIONS

A. Underground Sub-drainage Piping; provide one of the following:
1. Perforated PE pipe and fittings, couplings, and coupled joints.
2. Perforated PVC sewer pipe and fittings for loose, bell-and-spigot joints.

B. Header Piping:
1. Cast-iron soil pipe and fittings, gaskets; and gasketed joints.
2. PVC sewer pipe and fittings, couplings, and coupled joints.

3.4 CLEANOUT APPLICATIONS

A. In Underground Sub-Drainage Piping:
   1. At Grade in Earth: PVC cleanouts, unless otherwise noted.
      a. Provide cast-iron cleanouts, where indicated.

3.5 PIPING INSTALLATION

A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
   1. Under-pavement Sub-drainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent.
   2. Lay perforated pipe with perforations down.
   3. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.

B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

C. Install PE piping according to ASTM D 2321.

D. Install PVC piping according to ASTM D 2321.

3.6 SYNTHETIC GRASS SURFACING ATHLETIC FIELD DRAINAGE INSTALLATION (Only as Required)

A. Install drainage pipe main lines with a horizontal distance of at least 6 inches between pipe and trench walls. Grade bottom of trench excavations to required slope and compact to firm, solid bed for drainage system.

B. Following installation of filter fabric over field subgrade install flatpipe drain system @15’ o.c. and lay over top of perimeter mainline piping.

C. Drainage Fill: Place supporting layer of drainage fill over trench bottom to compacted depth of not less than 4 inches. After installing drainage piping, add drainage fill to top of pipe to perform tests. After satisfactory testing, cover piping to subgrade of synthetic grass surfacing. Place drainage fill in layers not exceeding 3 inches in loose depth; compact each layer placed.
   1. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with electrical tape.

3.7 PIPE JOINT CONSTRUCTION

A. Join PE pipe, tubing, and fittings with couplings for soil-tight joints according to AASHTO's "Standard Specifications for Highway Bridges," Division II, Section 26.4.2.4, "Joint Properties."

B. Join perforated, PE pipe and fittings with couplings for soil-tight joints according to AASHTO's "Standard Specifications for Highway Bridges," Division II, Section 26.4.2.4, "Joint Properties"; or according to ASTM D 2321.

C. Join PVC pipe and fittings according to ASTM D 3034 with elastomeric seal gaskets according to ASTM D 2321.

D. Join perforated PVC pipe and fittings according to ASTM D 2729, with loose bell-and-spigot joints.

E. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.8 CLEANOUT INSTALLATION

A. Cleanouts for Landscaping Sub-drainage:
   1. Install cleanouts from piping to grade. Locate cleanouts at beginning of piping run and at changes in direction or as noted. Install fittings so cleanouts open in direction of flow in piping.
   2. In vehicular-traffic areas, use NPS 4 cast-iron soil pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, 18 by 18 by 12 inches in depth. Set top of cleanout flush with grade. Cast-iron pipe may also be used for cleanouts in non-vehicular-traffic areas.
   3. In non-vehicular-traffic areas, use PVC pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, 12 by 12 by 4 inches in depth. Set top of cleanout plug 1 inch above grade.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect low elevations of sub-drainage system to building's solid-wall-piping storm drainage system or storm structures.

3.10 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping.
   1. Install PE warning tape or detectable warning tape over ferrous piping.
   2. Install detectable warning tape over nonferrous piping and over edges of underground structures.

3.11 FIELD QUALITY CONTROL

A. Testing: After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

B. Drain piping will be considered defective if it does not pass test and inspections.

3.12 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 33 46 00