
PROPOSED:

Hopewell Phase I East Infrastructure Project

LETTING DATE: May 3rd, 2023

AWARD DATE: May 9th, 2023

or subsequent BPW Meeting

FOR:

THE CITY OF BLOOMINGTON

ENGINEERING DEPARTMENT

POST OFFICE BOX 100

BLOOMINGTON, INDIANA

SUBMITTED BY:

Company or Firm Name

Street and Number

City or Town

State Zip Code

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SECTION I

INVITATION TO BIDDERS

INVITATION TO BIDDERS

NOTICE IS HEREBY GIVEN THAT THE BOARD OF PUBLIC WORKS OF THE CITY OF BLOOMINGTON, INDIANA WILL RECEIVE SEALED BIDS FOR THE BELOW-DESCRIBED WORK AT THE LOCATION INDICATED.

Hopewell Phase I East Infrastructure Project

This project shall include, but is not limited to, the construction of new roadway, sidewalk and multiuse path, curbing, landscaping, stormwater infrastructure, and other work as required per the plans and specifications.

Bids are to be submitted in proper form, as described in the "Instructions to Bidders" which can be found on the City's website at <https://bloomington.in.gov/engineering/bids>. Sealed bids shall be received by the Department of Public Works, at City Hall, 401 North Morton Street, Atrium, Bloomington, Indiana, at or before 11:45 AM local time on Wednesday, May 3rd, 2023. Bids will be publicly opened and read aloud at a public meeting at 12:00 Noon local time on Wednesday May 3rd, 2023, in the McCloskey Conference Room in City Hall at the Showers Building, 401 N. Morton Street, Bloomington, Indiana. Any Bids received after the designated time will be returned unopened. Bids will be reviewed and the award may be made at the May 9th 2023, regular meeting of the Board of Public Works which will be held in the Council Chambers of City Hall at the Showers Building, 401 N. Morton Street, Bloomington, Indiana, and by using the following link: <https://bloomington.in.gov/boards/public-works>, or a subsequent meeting of the Board of Public Works.

Each Bidder shall file with his or her sealed bid:

- (1) a properly executed Non-collusion Affidavit as required by the laws of the State of Indiana;
- (2) a Questionnaire Form 96 of the State Board of Accounts;
- (3) a cashier's check or certified check drawn on an acceptable bank or a Bid bond equal to five (5) percent of the total amount of bid;
- (4) a properly executed Trench Safety Systems Affidavit, if project may require creation of a trench of at least five (5) feet in depth;
- (5) a properly executed Employee Drug Testing Program Affidavit for a public works project estimated to cost at least \$150,000; and
- (6) a copy of the bidder's written plan for an employee drug testing program to test the employees of the bidder for drugs.

For projects utilizing Federal funding, wage rates shall be in compliance with the Davis Bacon Act. For bids of \$100,000.00 or more, the successful bidder shall furnish both a performance bond and a payment bond for one hundred percent (100%) of the contract amount prior to the execution of the contract, and the performance bond and the payment bond shall remain in effect for a period of one (1) year after final acceptance of the work.

A pre-bid meeting will be held on Wednesday, March 29th, 2023, at 2:00 PM local time in the McCloskey Conference Room at the Showers Building, 401 N. Morton Street, Bloomington, Indiana. All potential Bidders are encouraged to attend, however this meeting is not mandatory.

Each Bidder must ensure that to the greatest extent feasible, opportunities for training and employment should be given to lower income residents of the project area and purchases and/or contract for work in connection with the project should be awarded to small business concerns which are located in, or owned in substantial part, by persons residing in the area of the project.

The City of Bloomington is an equal opportunity employer, and Bidder shall meet all requirements for equal employment under Title VII of the 1964 Civil Rights Act as amended and under the Bloomington Human Rights Ordinance, as amended.

Each Bidder for proposals over \$10,000.00 shall submit and have approved by the City of Bloomington Contract Compliance Officer, Audrey Brittingham, his/her written Affirmative Action Plan at least twenty-four (24) hours prior to the deadline for submission of bid. Bidders who fail to submit acceptable plans by the deadline are subject to disqualification. Each Bidder must insure that all employees and applicants for employment are not discriminated against because of race, religion, color, sex, national origin, ancestry, disability, sexual orientation, gender identity, veteran status or housing status. All the protected classes must be included in your Affirmative Action Plan for it to be acceptable. In addition to other requirements, your plan MUST include a workforce breakdown, an internal grievance procedure, a non-retaliation statement, designation of a person by name or position who is responsible for implementation of the Plan, applicability to both applicants and employees, recruitment of minorities, equal access to training programs, and an explanation of your method of communicating the operations of your affirmative action plan to employees and prospective applicants. Audrey Brittingham, Contract Compliance Officer, may be contacted at (812) 349-3426, 8:00 a.m. to 5:00 p.m. Monday through Friday.

Each Bidder required to submit an affirmative action plan now must also submit a harassment plan. The harassment plan must, at minimum, include a definition of harassment, the name or title of the individual designated to receive and investigate complaints and a statement that the contractor will not retaliate against an employee for complaining about harassment. A model harassment policy is included for your convenience, which you may amend and adapt as your own. Please note that this harassment policy requirement is new, adopted by the Bloomington Common Council in June 2019.

In accordance with City Ordinance 2.28, otherwise known as the "Living Wage Ordinance" or "LWO", contractors that are considered "covered employers" are required to pay their covered employees at least a living wage. Currently, the living wage is \$15.29 per hour for covered employees, and up to 15% of that amount, or \$2.29, may be in the form of the covered employer's contribution to health insurance available to the covered employee.

In accordance with Indiana Code 36-1-12-24, each Contractor that submits a bid for a public works project that is estimated to cost \$150,000 or more shall submit with his/her bid a written plan for an employee drug testing program that complies with Indiana Code 4-13-18 *et seq.*

For Bids in excess of \$300,000 on Public Works projects that are not for the construction, alteration or repair of a highway, street or alley, the Contractor must be pre-qualified with the Indiana Public Works Certification Board in accordance with Indiana Code 4-13.6-4-2.5.

If the project may require creation of a trench of at least five (5) feet in depth, the low bidder shall be required to submit a trench safety plan to the project engineer at least ten (10) days prior to beginning work on the project.

The Board of Public Works reserves the right to waive any informality and to accept or reject any or all bids submitted. Bids may be held by the Board of Public Works for a period not-to-exceed sixty (60) days from the date of the opening of Bids for the purpose of reviewing the Bids and investigating the qualifications of the Bidders prior to awarding the contract.

Board of Public Works, City of Bloomington, Indiana

Kyla Cox Deckard, President

SECTION II

INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

1.00 CONTRACT DOCUMENTS: Contract Documents that will form the Contract are:

1. The Agreement and its Attachments
2. The Invitation to Bidders
3. The Instructions to Bidders
4. The Performance Bond and the Payment Bond
5. The Specifications
6. The General Conditions
7. The Supplementary Conditions
8. The Special Conditions
9. The Escrow Agreement
10. Request for taxpayer identification number and certification: Substitute W-9.
11. All Addenda to the Bid Documents
12. All Written Amendments and other documents amending, modifying, or supplementing the Contract Documents which may be delivered or issued after the Effective Date of the Agreement and are not attached hereto.
13. CONTRACTOR'S submittals
14. The current Indiana Department of Transportation Standard Specifications and the latest addenda.
15. All plans as provided for the work that is to be completed.

1.01 DEFINED TERMS:

1.01(A) Bidder: The individual or entity who submits a Bid directly to the Owner.

1.01(B) Successful Bidder: The lowest responsible and responsive Bidder to whom Owner makes an award.

1.02 INSPECTION OF THE SITE: Bidder shall examine each of the Contract Documents, visit the site of the work and thoroughly and fully inform themselves of the construction hazards, procedures, labor, conditions and factors, which could affect the prosecution and completion of the work. Such considerations shall include; the conditions of existing structures and facilities which may be affected by the proposed work, the procedure necessary for maintenance of uninterrupted operation of existing facilities, the availability and cost of labor and methods for transporting, handling, and storage of materials and equipment. All such factors shall be properly investigated and considered in the preparation of the Bidder's Bid. There will be no subsequent financial adjustment to any contract for lack of such prior information or its effects on the cost of the work.

1.03 OMISSIONS AND DISCREPANCIES: Should Bidders find discrepancies in, or omissions from, the Contract Documents, or should they be in doubt as to their meaning, written notification should be made to the City Engineer. Interpretation of the proposed contract documents will be made only by written addendum. A copy of each addendum will be posted at the City's web site at <https://bloomington.in.gov/engineering/bids>. The Owner will not be responsible for any other explanations or interpretations of the proposed contract documents.

1.04 PRE-BID CONFERENCE: A non-mandatory pre-bid conference may be held at the time and location indicated in the Advertisement or Invitation to Bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference; however, attendance at this conference is not required to submit a Bid. Information

presented at the pre-bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

1.05 INTERPRETATIONS AND ADDENDA: Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.

Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:

City of Bloomington
Attn: Matt Smethurst
Email: smethurm@bloomington.in.gov
Phone: 812-349-3514

Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received fewer than four (4) working days prior to the date for opening of Bids may not be answered.

Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

2.00 BIDS: Pursuant to the "Invitation to Bidders" sealed Bids for performing the work shall be received by the Department of Public Works, at City Hall, 401 North Morton Street, Atrium, Bloomington, Indiana, at or before 11:45 AM local time on Wednesday, May 3rd, 2023. Bids will be publicly opened and read aloud at a public meeting at 12:00 Noon local time on Wednesday, May 3rd, 2023, in the McCloskey Conference Room in City Hall at the Showers Building, 401 N. Morton Street, Bloomington, Indiana. Any Bids received after the designated time will be returned unopened. Bids will be reviewed and the award may be made at the May 9th, 2023, regular meeting of the Board of Public Works which will be held in the Council Chambers of City Hall at the Showers Building, 401 N. Morton Street, Bloomington, Indiana, and by using the following link: <https://bloomington.in.gov/boards/public-works>, or a subsequent meeting of the Board of Public Works. If requested by project manager, the City's Substitute IRS W-9 form shall be executed by Bidder and received by the City prior to the issuance of a Notice to Proceed to Bidder.

2.01 BASIS OF BID: Bidders must submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form. The "Bid Price" (sometimes referred to as the extended price or Bid Amount) for each unit price Bid item will be the product of the "Approximate Quantity", which Owner or its representative has set forth in the Bid Form, for the item and the corresponding "Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 11.06 of the General Conditions.

2.02 BID FORM: Each Bid shall be legibly written or printed in ink on the Bid Form with Unit Prices provided if applicable. All addenda to the Contract Documents on which a Bid is based, properly signed by the Bidder, shall accompany the Bid when submitted. No alteration in any Bid, or in the Bid Form on which it is submitted, shall be made by any person after the Bid has been submitted by the Bidder. Please indicate on the Bid Form whether you would want to receive a Single Lump

Sum Payment following acceptance of this project or if you would want to receive Progressive Payments during the course of this project.

- 2.03 BID SIGNATURES:** Each Bidder shall sign his/her Bid using his/her usual signature and giving his/her full business address. Bids by partnerships shall be signed with the partnership name followed by the signature and designation of one of the partners or other authorized representative. Bids by corporations shall be signed with the name of the corporation followed by the signature and designation of the president, secretary, or other person authorized to bind the corporation. The names of all persons signing should also be typed or printed below the signature. A Bid by a person who affixes to his/her signature the word "president" or "secretary", "agent", or other designation without disclosing his/her principal may be held to be the Bid of the individual signing. When requested by the Owner, satisfactory evidence of the authority of the person signing shall be furnished. No Bidder may submit more than one Bid. Two Bids under different names will not be accepted from one firm or association.
- 2.04 BID SUBMISSION:** Each Bid submitted shall be enclosed in a sealed envelope or wrapping, identified on the outside with the words "SEALED BID", and the name of the project, and shall be received by the Department of Public Works at City Hall, 401 North Morton Street, Atrium, Bloomington, Indiana, on the date and at the time provided above in 2.00 BIDS.
- 2.05 INDIANA LEGAL REQUIREMENTS:** Each bidder shall submit under oath with his/her Bid a statement of his/her experience, proposed plan for performing the Work, equipment available to perform the work, and a financial statement. The statements shall be submitted on Questionnaire Form No. 96 of the Indiana State Board of Accounts. Each Bid shall be accompanied by a properly executed Non-Collusion Affidavit as required by the laws of the State of Indiana.
- 2.06 BID GUARANTEE:** Each Bid shall be accompanied by a cashier's check or a certified check drawn on an acceptable bank, or an acceptable Bidder's bond in an amount of not less than five percent (5%) of the total Bid. No personal and/or company checks will be accepted or the Bid shall be deemed unresponsive. The Bid guarantee shall be made payable without condition to the City of Bloomington, Indiana, hereinafter referred to as "Owner", and the amount of said Bid Guarantee may be retained by and forfeited to the Owner as liquidated damages if the Bid covered thereby is accepted and a contract based thereon is awarded and the Bidder should fail to enter into a contract in the form prescribed, with legally responsible sureties, within fifteen (15) days after such award is made and confirmed by the Owner.
- 2.07 RETURN OF BID GUARANTEE:** The Bid Guarantee deposit of each unsuccessful Bidder will be returned when his/her Bid is rejected. The Bid Guarantee deposit of the Bidder to whom the Contract is awarded will be returned when the successful Bidder executes a contract and files a satisfactory performance bond and payment bond. The Bid Guarantee deposit of the second and third lowest responsible Bidders may be retained for a period not to exceed ninety (90) days pending the execution of the Contract and bonds by the successful Bidder.
- 2.08 WITHDRAWAL OF BID:** No Contractor may withdraw his/her Bid for a period of sixty (60) days after the date and hour set for the opening, and the Bidders submitting the three lowest Bids may not withdraw their Bid for a period of one hundred eighty (180) days after the opening date. A Bidder may withdraw his/her Bid at any time prior to the expiration of the Bid period during which Bids may be submitted by a written request signed in the same manner and by the same person who signed the Bid.
- 2.09 ACCEPTANCE AND REJECTION OF BIDS:** The Owner reserves the right to accept the Bid submitted by the lowest responsible and responsive Bidder; to reject any or all Bids; and to waive

irregularities or informalities in any Bid. Bids received after the specified time of closing will be returned unopened. The acceptance of a Bid shall bind the successful Bidder to execute the Contract and to be responsible for liquidated damages as provided in Section 4.00 below and in section 13.00 of the General Conditions.

3.00 QUALIFICATION OF BIDDERS: Bidders shall submit satisfactory evidence that they have a practical knowledge of the particular work Bid upon, and that they have the necessary financial resources to complete the proposed work. Each Bidder shall execute completely and accurately 'Questionnaire Form No. 96' of the Indiana State Board of Accounts and the 'Request for taxpayer identification number and certification' form of the City of Bloomington and shall file the same with his/her Bid. The information contained therein shall be used by the Owner to determine the ability, experience, and capital resources of the Bidder. In determining the Bidder's qualifications, the following factors will be considered: whether the Bidder (a) maintains a permanent place of business; (b) has adequate plant and equipment to do the work properly and expeditiously; (c) has the necessary financial resources to meet all obligations incident to the work; (d) has appropriate technical experience; and (e) can be added as an approved vendor to the City of Bloomington. Each Bidder may be required to show that previous work performed has been handled in such a manner that there are no just and proper claims pending against such work. No Bid will be accepted which is submitted by a Bidder who is engaged in any work which would impair their ability to finance the work covered by such Bid or to provide suitable equipment for its proper prosecution and completion.

3.01 PRE-QUALIFICATION OF CONTRACTORS: For bids in excess of \$300,000 on Public Works projects that are not considered the construction, alteration, or repair of a highway, street, or alley, the Contractor shall be pre-qualified with the Indiana Public Works Certification Board prior to starting work.

4.00 EXECUTION OF CONTRACT: Any Bidder whose Bid shall be accepted will be required to appear at the office of the City Engineer in person, or, if a firm or corporation, a duly authorized representative shall so appear, to execute the Contract within fifteen (15) days after notice that the Contract has been awarded to him/her. Failure or neglect to do so shall constitute a breach of the agreement effected by the acceptance of the Bid. The amount of the Bid Guarantee accompanying the Bid of such Bidder may be retained by the City as liquidated damages for such breach. In the event that any Bidder whose Bid shall be accepted shall fail or refuse to execute the Contract as hereinbefore provided, the Board of Public Works may at their option, determine that such Bidder has abandoned the Contract and thereupon his/her Bid and the acceptance thereof shall be null and void and the Owner shall be entitled to liquidated damages as provided herein.

4.01 INSURANCE: The Contractor will be required to carry insurance throughout the lifetime of the Contract, as provided in the General Conditions, the amount of insurance of the various types being not less than the amounts specified therein.

4.02 PAYMENTS: Payment for all work performed under the proposed contract will be made in cash, or its equivalent, by the Owner within sixty (60) days after completion and final acceptance of the work covered by the contract. Partial estimates will be issued and paid as provided in the General Conditions.

4.03 TIME FOR BEGINNING AND COMPLETING THE WORK: The Contractor shall start active and continuous work on the contract within fifteen (15) calendar days after the date of the notice to proceed. All work shall be completed by October 31, 2024. Calendar and work days shall be as defined in the General Conditions of these documents.

- 4.04 TAXES AND PERMITS:** Attention is directed to the requirements of the General Conditions regarding payments of taxes and obtaining permits. The Contractor shall be responsible for obtaining all necessary permits.
- 4.05 WORKER'S COMPENSATION:** Before any work is started, the Contractor shall obtain from the Indiana State Industrial Board and file with the Owner, a certificate as evidence of compliance with the provisions of the Indiana Worker's Compensation Act and the Indiana Worker's Occupational Diseases Act.
- 4.06 PERFORMANCE BOND:** For all contracts in the amount of \$100,000.00 or more, the Bidder to whom a contract is awarded will be required to furnish a Performance Bond to the Owner in an amount equal to one hundred percent (100%) of the contract price. The bond shall be executed on the form included in the Contract Documents by a surety company authorized to do business in the State of Indiana and acceptable as surety to the Owner. Accompanying the bond shall be a "Power of Attorney" authorizing the attorney-in-fact to bind the surety company and certified to include the date of the bond. The surety on the Performance Bond cannot be released for one year, and the bond must require that the surety will not be discharged for:
1. modifications, omissions, or additions;
 2. defects in the contract; or
 3. defects in the Bidding or awarding process.
- 4.07 PAYMENT BOND:** For all contracts in the amount of \$100,000.00 or more, the Bidder to whom a contract is awarded will be required to furnish a Payment Bond to the Owner in an amount equal to one hundred percent (100%) of the contract price. The bond shall be executed on the form included in the Contract Documents by a surety company authorized to do business in the State of Indiana and acceptable as surety to the Owner. Accompanying the bond shall be a "Power of Attorney" authorizing the attorney-in-fact to bind the surety company and certified to include the date of the bond. The surety on the Payment Bond cannot be released until one year after the Board's final settlement with the Contractor, and the bond is required to insure payment of subcontractors, laborers, material suppliers, and persons furnishing services. The bond must provide the same assurances as does the Performance Bond against conditions discharging the surety.
- 4.08 LOCAL MATERIALS:** Preference will be given to materials, products, supplies, and all other articles produced, manufactured, made, or grown in the State of Indiana.
- 4.09 NON-DISCRIMINATION IN EMPLOYMENT:** Each Bidder for Bids over \$10,000.00 shall submit and have approved by the City of Bloomington Contract Compliance Officer, Audrey Brittingham, his/her written Affirmative Action Plan at least twenty-four (24) hours prior to the deadline for submission of Bids. Bidders who fail to submit acceptable plans by the deadline are subject to disqualification. Each Bidder must insure that all employees and applicants for employment are not discriminated against because of race, religion, color, sex, national origin, ancestry, disability, sexual orientation, gender identity, veteran status or housing status. All the protected classes must be included in your Affirmative Action Plan for it to be acceptable. In addition to other requirements, your plan MUST include a workforce breakdown, an internal grievance procedure, a non-retaliation statement, designation of a person by name or position who is responsible for implementation of the Plan, applicability to both applicants and employees, recruitment of minorities, equal access to training programs, and an explanation of your method of communicating the operations of your affirmative action plan to employees and prospective applicants. Audrey Brittingham, Contract Compliance Officer, may be contacted at (812) 349-3426, 8:00 a.m. to 5:00 p.m. Monday through Friday. The successful Bidder must comply with each section of its

affirmative action plan and be prepared to comply in all respects with the contract provisions regarding non-discrimination which are included in the Employment Requirement and Wage Rate section. For contracts paid in whole or in part with federal funds, the Bidder must submit a signed statement as to whether he or she has previously performed work subject to Executive Order 11246. For contracts paid in whole or in part with federal funds, the successful Bidder must, if requested, submit a list of all subcontractors who will perform work on the project, and written and signed statements from authorized agents of the labor pools with which he/she will or may deal for employees on the work, together with supporting information to the effect that said labor pools' practices and policies are in conformity with Executive Order 11246, and that said labor pools will affirmatively cooperate in, or offer no hindrance to, recruitment, employment, and equal treatment of employees seeking employment, and performing work under the Contract, or a certification as to what efforts have been made to secure such statements when such agents or labor pools have failed or refused to furnish same, prior to the award of the Contract.

4.10 Harassment Policy: Each Bidder required to submit an affirmative action plan now must also submit a harassment plan. The harassment plan must, at minimum, include a definition of harassment, the name or title of the individual designated to receive and investigate complaints and a statement that the contractor will not retaliate against an employee for complaining about harassment. A model harassment policy is included for your convenience in Section IV of this bidding packet, which you may amend and adapt as your own. Please note that this harassment policy requirement is new, adopted by the Bloomington Common Council in June, 2019.

4.11 Permits: Contractor is responsible for obtaining all permits.

SECTION III

BID FORM

UNIT PRICES

SAMPLE BOND FORMS

ESCROW AGREEMENT

BID FORM

This BID Summary Sheet shall be completed and submitted with all other BID Documents.

The total project bid amount to complete the Hopewell Phase I East Infrastructure Project including all associated work per plans and specification is:

Base Bid		\$
Alternate #1		\$
Alternate #2		\$
Alternate #3		\$

For projects requiring submission of Trench Safety Systems Affidavit, the portion of the total project bid cost provided above which is attributable to trench safety systems is \$_____.

Requested Form of Payment (Choose one):	<input type="checkbox"/>	A Single Lump Sum Payment following completion of the project. Invoice shall be submitted within sixty (60) days following acceptance of the project.
	<input type="checkbox"/>	Progressive Payments for work completed and invoiced throughout the project.

All work shall be completed by October 31st, 2024.

Any and all Subcontractors performing work valued over \$10,000 shall be listed below: Any subcontractor not listed below at the time of bid, must be approved by the City of Bloomington prior to performing any work on this contract. Subcontractors not listed or approved will not be paid for work under this contract. In accordance with Indiana Code 5-16-13 *et seq.*, incorporated herein by reference, any subcontractor performing work on this contract is a Tier 2 contractor.

SUBCONTRACTORS	ADDRESS	TYPE OF WORK

In submitting this Bid, Bidder represents that:

- A. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, performance, and furnishing of the Work.
- B. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents and the following Addenda, receipt of which is hereby acknowledged.

No. _____	Dated _____
No. _____	Dated _____
No. _____	Dated _____

Final Invoice shall be submitted within thirty (30) days following final acceptance of the project.

SIGNATURE OF BIDDER

Name of Bidder: _____

Date: _____

By: _____

Name & Title Printed: _____

Bidder Address: _____

Telephone: _____

UNIT PRICES



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and Units	UNITS	UNIT PRICE	BID AMOUNT
001		STORMWATER MANAGEMENT BUDGET	1	LS	\$67,465.00	\$67,465.00
002		TEMPORARY SILT FENCE	1,475	LFT	\$2.15	\$3,171.25
003		TEMPORARY INLET PROTECTION	38	EACH	\$110.00	\$4,180.00
004		TEMPORARY SEEDING	713	LBS	\$2.75	\$1,960.75
005		MAINTENANCE OF TRAFFIC	1	LS	-	-
006		CLEARING RIGHT OF WAY	1	LS	-	-
007		WATER AND SERVICE LINE, REMOVE	298	LFT	-	-
008		ASPHALT MILLING 1.5"	324	SYS	-	-
009		PAVEMENT REMOVAL	17,660	SYS	-	-
010		CURB, REMOVE	3,398	LFT	-	-
011		SIDEWALK CONCRETE, REMOVE	895	SYS	-	-
012		SIGN, REMOVE	49	EACH	-	-
013		RETAINING WALL, REMOVE	584	LFT	-	-
014		INLET, REMOVE	13	EACH	-	-
015		MANHOLE, REMOVE	3	EACH	-	-
016		MISCELLANEOUS CONCRETE, REMOVE	42	SYS	-	-
017		PIPE, REMOVE	1,272	LFT	-	-
018		SANITARY SEWER, REMOVE	694	LFT	-	-
019		FENCE & POSTS, REMOVE	32	LFT	-	-
020		FIRE HYDRANT, ASSEMBLY, REMOVE	1	EACH	-	-
021		LIGHT POLE, REMOVE	19	EACH	-	-
022		GUARDRAIL, REMOVE	120	LFT	-	-
023		RETAINING WALL, TYPE 1	78	LFT	-	-
024		RETAINING WALL, TYPE 2	45	LFT	-	-
025		EXCAVATION, COMMON	13,135	CYS	-	-
026		SUBGRADE TREATMENT, TYPE IC (MODIFIED)	3,060	SYS	-	-
027		GEOGRID - INTERAX FILTERGRID NX750-FG	3,060	SYS	-	-
028		COMPACTED LIMESTONE SHOULDER	8	CYS	-	-
029		COMPACTED SAND	12	CYS	-	-
030		COMPACTED AGGREGATE NO. 8	265	CYS	-	-
031		COMPACTED AGGREGATE NO. 53	1055	TON	-	-

Continued on next page.



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
032		HOT MIX ASPHALT, 2, 64, SURFACE, 9.5MM	693	TON	-	-
033		HOT MIX ASPHALT, 2, 64, INTERMEDIATE, 19MM	601	TON	-	-
034		HOT MIX ASPHALT, 3, 64, BASE, 25MM	903	TON	-	-
035		SIDEWALK, CONCRETE	1,814	SFT	-	-
036		CURB, CONCRETE	2,313	LFT	-	-
037		CURB, CONCRETE, 8"	249	LFT	-	-
038		CURB, INTEGRAL CONCRETE	262	LFT	-	-
039		CURB, CONCRETE, DEPRESSED	33	LFT	-	-
040		CONCRETE ENTRANCE	385	SYS	-	-
041		PARKING BARRIER, CONCRETE	7	EACH	-	-
042		LINE, PAINT, SOLID, WHITE, 4 IN.	1,067	LFT	-	-
043		LINE, PAINT, SOLID, BLUE, 4 IN.	122	LFT	-	-
044		PAVEMENT MESSAGE MARKING, PAINT, ADA ACCESSIBLE SYMBOL	4	EACH	-	-
045		PAVEMENT MESSAGE MARKING, MULTI-COMPONENT, LANE INDICATION ARROW	8	EACH	-	-
046		SIGN POST, SQ TYP 2, UNREINF, ANCHOR BASE	120	LFT	-	-
047		SIGN POST ASSEMBLY	12	EACH	-	-
048		SIGN, SHEET, WITH LEGEND, 0.80 IN. THICKNESS	53	SFT	-	-
049		SIGN, DOUBLE-FACED, SHEET, WITH LEGEND, 0.100 IN. THICKNESS	21	SFT	-	-
050		SIGN, SHEET, WITH LEGEND, 0.100 IN. THICKNESS	9	SFT	-	-
051		MULCHED SEEDING	15,547	SYS	-	-
052		WATER MAIN, 12 IN.	1,132	LFT	-	-
053		TAPPING SADDLE 24" X 12"	1	EACH	-	-
054		TAPPING SADDLE 12" X 12"	1	EACH	-	-
055		TAPPING VALVE 12"	2	EACH	-	-
056		M.J. 12 X 12" CROSS	1	EACH	-	-
057		M.J. 12 X 12" TEE	1	EACH	-	-
058		24" X 6" HOT TAP FOR FIRE HYDRANT	1	EACH	-	-

Continued on next page.



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
059	M.J. 22.5 DEG ELBOW, 12"		10	EACH	-	-
060	M.J. 45 DEG ELBOW 12"		9	EACH	-	-
061	M.J. 90 DEG ELBOW 12"		1	EACH	-	-
062	M.J. GATE VALVE 12"		4	EACH	-	-
063	M.J. PLUG, 12"		2	EACH	-	-
064	FIRE HYDRANT ASSEMBLY		5	EACH	-	-
065	1" DOMESTIC SERVICE TAP		2	EACH	-	-
066	TEMPORARY CHLORINATION TAP		2	EACH	-	-
067	TEMPORARY BLOW-OFF ASSEMBLY		3	EACH	-	-
068	TESTING OF WATER MAINS (CBU SPECIFICATIONS)		1	LS	-	-
069	SANITARY MANHOLE (CBU STD. DET. 1)		5	EACH	-	-
070	SANITARY MANHOLE MODIFIED (CBU STD. DET. 1)		1	EACH	-	-
071	CONFLICT MANHOLE		1	EACH	-	-
072	PIPE, SANITARY SEWER, 8 IN., C-900		401	LFT	-	-
073	PIPE, SANITARY SEWER, 8 IN., SDR-35		490	LFT	-	-
074	PIPE, SANITARY SEWER, 8 IN., DUCTILE IRON		301	LFT	-	-
075	SANITARY LATERAL ASSEMBLY, 6"		11	EACH	-	-
076	PIPE, STORM SEWER, 12 IN., RCP		549	LFT	-	-
077	PIPE, STORM SEWER, 15 IN., RCP		509	LFT	-	-
078	PIPE, STORM SEWER, 18 IN., RCP		747	LFT	-	-
079	PIPE, STORM SEWER, 24 IN., RCP		319	LFT	-	-
080	PIPE, STORM SEWER, 36 IN., RCP		760	LFT	-	-
081	PIPE, STORM SEWER, 42 IN., RCP		220	LFT	-	-
082	PIPE, STORM SEWER, 6 IN., PVC		135	LFT	-	-
083	PIPE, STORM SEWER, 15 IN., PVC		34	LFT	-	-

Continued on next page.



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
084		PIPE, STORM SEWER, 12 IN., HDPE	226	LFT	-	-
085		PIPE, STORM SEWER, 15 IN., HDPE	32	LFT	-	-
086		PIPE, STORM SEWER, 18 IN., HDPE	0	LFT	-	-
087		UNDERDRAIN, 4 IN., PERFORATED	1,520	LFT	-	-
088		PIPE END SECTION, 18 IN. DIA.	1	EACH	-	-
089		NYLOPLAST DRAIN BASINS	2	EACH	-	-
090		CENTERSTONE STORMWATER DETENTION SYSTEM	1	LS	-	-
091		PLAZA STORMWATER DETENTION SYSTEM	1	LS	-	-
092		LOT 1 STORMWATER DETENTION SYSTEM	1	LS	-	-
093		LOT 5 STORMWATER DETENTION SYSTEM	1	LS	-	-
094		MANHOLE, TYPE J	4	EACH	-	-
095		MANHOLE, TYPE C	15	EACH	-	-
096		MANHOLE, TYPE K	7	EACH	-	-
097		MANHOLE, TYPE D	1	EACH	-	-
098		INLET, TYPE A	6	EACH	-	-
099		INLET, TYPE J	8	EACH	-	-
100		INLET, TYPE M	11	EACH	-	-
101		24" x 24" RECTANGULAR CONCRETE STRUCTURE	2	EACH	-	-
102		WQU - AQUA SWIRL XC-4	3	EACH	-	-
103		WQU - AQUA SWIRL XC-7	1	EACH	-	-
104		FIBER OPTIC CONDUIT	2764	LFT	-	-
105		FIBER OPTIC JUNCTION BOX	3	EACH	-	-
106		CONCRETE STEPS	20	CYS	-	-
107		UTILITY ACCESS TRENCH	13	LFT	-	-
108		FOOTING, PAVILION	22	CYS	-	-
109		LIMESTONE QUARRY BLOCK (RAMP)	1	LS	-	-
110		LIMESTONE STEPPER, TYPE A	25	EACH	-	-
111		LIMESTONE STEPPER, TYPE B	6	EACH	-	-
112		LIMESTONE STEPPER, TYPE C	3	EACH	-	-
113		LIMESTONE BLOCK CLUSTER, GROUP 1	1	LS	-	-
114		LIMESTONE BLOCK CLUSTER, GROUP 2	1	LS	-	-
115		LIMESTONE BLOCK CLUSTER, GROUP 3	1	LS	-	-

Continued on next page.



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
116		LIMESTONE, HEADWALL	1	LS	-	-
117		SST HANDRAIL AND POST	310	LFT	-	-
118		SCREEN WALL	1	LS	-	-
119		LOG SCRAMBLE	1	LS	-	-
120		ELECTRICAL, SYSTEM	1	LS	-	-
121		SIDEWALK, CONCRETE, MODIFIED	12,683	SFT	-	-
122		CONCRETE PAVEMENT, 6 IN.	1,448	SFT	-	-
123		CONCRETE PAVEMENT, 8 IN.	800	SFT	-	-
124		CURB, CONCRETE, MODIFIED	808	LFT	-	-
125		CONCRETE CONTAINMENT CURB, 8 IN.	3,855	LFT	-	-
126		CONCRETE CONTAINMENT CURB, 12 IN.	60	LFT	-	-
127		CONCRETE CONTAINMENT CURB, 24 IN.	40	LFT	-	-
128		UNIT PAVER, TYPE 1 (PEDESTRIAN)	936	SFT	-	-
129		UNIT PAVER, TYPE 2 (VEHICULAR)	88	SFT	-	-
130		UNIT PAVER, TYPE 3 (TACTILE WARNING)	2,251	SFT	-	-
131		METAL EDGE RESTRAINT, TYPE 1	72	LFT	-	-
132		METAL EDGE RESTRAINT, TYPE 2	46	LFT	-	-
133		METAL EDGE RESTRAINT, TYPE 3	46	LFT	-	-
134		PERMEABLE PAVERS, TYPE 1 (PEDESTRIAN)	23,912	SFT	-	-
135		PERMEABLE PAVERS, TYPE 2 (VEHICULAR)	47,892	SFT	-	-
136		DETECTABLE WARNING SURFACE	464	SFT	-	-
137		ARTIFICIAL TURF, STANDARD	3,154	SFT	-	-
138		ARTIFICIAL TURF, FALL RATED	1,322	SFT	-	-
139		IRRIGATION SYSTEM	1	LS	-	-
140		CISTERN PUMP AND TANK	1	LS	-	-
141		PLATFORM BENCH, TYPE 1	4	EACH	-	-
142		PLATFORM BENCH, TYPE 2 (STAGE)	1	LS	-	-

Continued on next page.



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
143	BENCH, TYPE 1		2	EACH	-	-
144	BENCH, TYPE 2		4	EACH	-	-
145	BENCH, TYPE 3		1	LS	-	-
146	SWING, STRUCTURE		2	EACH	-	-
147	FOOTBRIDGE		1	LS	-	-
148	PAVER GRATE, TYPE 1		10	EACH	-	-
149	PAVER GRATE, TYPE 2		24	EACH	-	-
150	UMBRELLA		2	EACH	-	-
151	BICYCLE RACK, TYPE 1		14	EACH	-	-
152	BICYCLE RACK, TYPE 2		8	EACH	-	-
153	DRINKING FOUNTAIN		2	EACH	-	-
154	REMOVABLE BOLLARD		14	EACH	-	-
155	BOLLARD RACK, TYPE 1		2	EACH	-	-
156	BOLLARD RACK, TYPE 2		1	EACH	-	-
157	PING PONG TABLE		2	EACH	-	-
158	PLANTING SOIL		1,397	CYS	-	-
159	PLANTER SOIL		10	CYS	-	-
160	TURF, SOD		709	SYS	-	-

Continued on next page.



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
161		DECIDUOUS TREE, SINGLE STEM, 1.25" to 2" TO 2"	42	EACH	-	-
162		DECIDUOUS TREE, SINGLE STEM, OVER 2" TO 2.5"	80	EACH	-	-
163		DECIDUOUS TREE, SINGLE STEM, OVER 2.5" TO 3.5"	5	EACH	-	-
164		DECIDUOUS TREE, MULTI-STEM, 96" TO 120"	17	EACH	-	-
165		DECIDUOUS SHRUB, 18" TO "24	484	EACH	-	-
166		CONIFEROUS, BROAD SPREADING	151	EACH	-	-
167		PLANT, ORNAMENTAL GRASS (#1)	1,029	EACH	-	-
168		PLANT,GROUND COVER	1,178	EACH	-	-
169		PLANT, PERENNIAL (#1)	3,681	EACH	-	-
170		PLANT, ANNUAL (32-CELL FLAT)	464	EACH	-	-
171		MULCH, HARDWOOD	180	CYS	-	-
172		LANDSCAPE EDGE, SPADE	638	LFT	-	-
173		LANDSCAPE EDGE, STEEL	60	LFT	-	-
174		DRY STREAM BED	945	SFT	-	-
175		SUSPENDED PAVEMENT ASSEMBLY	253	CYS	-	-
176		CONSTRUCTION LAYOUT	1	LS	-	-
177	110-01001	MOBILIZATION AND DEMOBILIZATION	1	LS	-	-
178		CONTAMINATED SOILS, STOCKPILE	18,495	TON	-	-
179	202-05546	REGULATED MATERIALS, DISPOSE, TYPE C	1,648	TON	-	-
180	202-05551	REGULATED MATERIALS, REMOVE, TYPE C	1,648	TON	-	-
181	202-05556	REGULATED MATERIALS, TRANSPORT, TYPE C	1,648	TON	-	-
182	203-02010	EXCAVATION, ROCK	100	CYS	-	-
183		RAISED PAVEMENT MARKER	3	EACH	-	-
184		SITE FURNISHING ANCHOR	62	EACH	-	-
186		BUILDING TRADE PARK SIGN, REMOVAL	1	LS	-	-

BID:



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
ALTERNATE #1 - SECTION 32 3300 - SITE FURNISHINGS						
A1-1	PAVILION		1	LS	_____ - ____	_____ - ____
						TOTAL ALTERNATE #1: _____ - ____
ALTERNATE #2 - SECTION 32 3300 - SITE FURNISHINGS						
A2-1	PAVILION, INSTALLATION		1	LS	_____ - ____	_____ - ____
						TOTAL ALTERNATE #2: _____ - ____
ALTERNATE #3 - SECTION 32 9200 - Turf and Grasses						
A3-1	EXTENDED MAINTENANCE PERIOD, SOD		1	LS	_____ - ____	_____ - ____
ALTERNATE #3 - SECTION 32 9300 - PLANTS						
A3-2	EXTENDED MAINTENANCE PERIOD, PLANTS		1	LS	_____ - ____	_____ - ____
						TOTAL ALTERNATE #3: _____ - ____

Bidder acknowledges that:

1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

BID BOND

Bidder Name: [Full formal name of Bidder] Address <i>(principal place of business)</i> : [Address of Bidder's principal place of business]	Surety Name: [Full formal name of Surety] Address <i>(principal place of business)</i> : [Address of Surety's principal place of business]
Owner Name: [Full formal name of Owner] Address <i>(principal place of business)</i> : [Address of Owner's principal place of business]	Bid Project <i>(name and location)</i> : [Owner project/contract name, and location of the project] Bid Due Date: [Enter date bid is due]
Bond Penal Sum: [Amount] Date of Bond: [Date]	
Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.	
Bidder <hr style="border: 0; border-top: 1px solid black; margin-bottom: 5px;"/> <i>(Full formal name of Bidder)</i> By: _____ <div style="text-align: center;"><i>(Signature)</i></div> Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div> Title: _____ Attest: _____ <div style="text-align: center;"><i>(Signature)</i></div> Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div> Title: _____	Surety <hr style="border: 0; border-top: 1px solid black; margin-bottom: 5px;"/> <i>(Full formal name of Surety) (corporate seal)</i> By: _____ <div style="text-align: center;"><i>(Signature) (Attach Power of Attorney)</i></div> Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div> Title: _____ Attest: _____ <div style="text-align: center;"><i>(Signature)</i></div> Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div> Title: _____
<i>Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary. (3) Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.</i>	

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
 - 3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2. All Bids are rejected by Owner, or
 - 3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

PERFORMANCE BOND

<p>Contractor</p> <p>Name: [Full formal name of Contractor]</p> <p>Address (<i>principal place of business</i>):</p> <p>[Address of Contractor's principal place of business]</p>	<p>Surety</p> <p>Name: [Full formal name of Surety]</p> <p>Address (<i>principal place of business</i>):</p> <p>[Address of Surety's principal place of business]</p>
<p>Owner</p> <p>Name: [Full formal name of Owner]</p> <p>Mailing address (<i>principal place of business</i>):</p> <p>[Address of Owner's principal place of business]</p>	<p>Contract</p> <p>Description (<i>name and location</i>):</p> <p>[Owner's project/contract name, and location of the project]</p> <p>Contract Price: [Amount from Contract]</p> <p>Effective Date of Contract: [Date from Contract]</p>
<p>Bond</p> <p>Bond Amount: [Amount]</p> <p>Date of Bond: [Date]</p> <p><i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form:</p> <p><input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
<p style="text-align: center;"><i>(Full formal name of Contractor)</i></p> <hr/> <p>By: _____</p> <p style="text-align: center;"><i>(Signature)</i></p> <p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p> <p>Title: _____</p> <p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p> <p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p> <p>Title: _____</p>	<p style="text-align: center;"><i>(Full formal name of Surety) (corporate seal)</i></p> <hr/> <p>By: _____</p> <p style="text-align: center;"><i>(Signature)(Attach Power of Attorney)</i></p> <p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p> <p>Title: _____</p> <p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p> <p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p> <p>Title: _____</p>
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:
 - 3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;
 - 3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
 - 3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
 - 5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
 - 5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
 - 5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or
 - 5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.
7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
 - 7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
 - 7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
 - 7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.
12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.
13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such statutory or other legal

requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

- 14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
 - 14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
 - 14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
 - 14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
16. A modification, omission, or addition to the terms and conditions of the public work contract, plans, specifications, drawings, or profile, or any defect in the public work contract or in the proceedings preliminary to the letting and awarding of the public work contract does not discharge the surety.
17. Modifications to this Bond are as follows: **[Describe modification or enter “None”]**

PAYMENT BOND

<p>Contractor</p> <p>Name: [Full formal name of Contractor]</p> <p>Address <i>(principal place of business)</i>: [Address of Contractor's principal place of business]</p>	<p>Surety</p> <p>Name: [Full formal name of Surety]</p> <p>Address <i>(principal place of business)</i>: [Address of Surety's principal place of business]</p>
<p>Owner</p> <p>Name: [Full formal name of Owner]</p> <p>Mailing address <i>(principal place of business)</i>: [Address of Owner's principal place of business]</p>	<p>Contract</p> <p>Description <i>(name and location)</i>: [Owner's project/contract name, and location of the project]</p> <p>Contract Price: [Amount, from Contract]</p> <p>Effective Date of Contract: [Date, from Contract]</p>
<p>Bond</p> <p>Bond Amount: [Amount]</p> <p>Date of Bond: [Date]</p> <p><i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 18</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
_____	_____
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____	By: _____
<i>(Signature)</i>	<i>(Signature)(Attach Power of Attorney)</i>
Name: _____	Name: _____
<i>(Printed or typed)</i>	<i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____	Attest: _____
<i>(Signature)</i>	<i>(Signature)</i>
Name: _____	Name: _____
<i>(Printed or typed)</i>	<i>(Printed or typed)</i>
Title: _____	Title: _____
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond will arise after the following:
 - 5.1. Claimants who do not have a direct contract with the Contractor
 - 5.1.1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 7.2. Pay or arrange for payment of any undisputed amounts.
 - 7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. Definitions
 - 16.1. *Claim*—A written statement by the Claimant including at a minimum:
 - 16.1.1. The name of the Claimant;
 - 16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;
 - 16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 - 16.1.4. A brief description of the labor, materials, or equipment furnished;

- 16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 - 16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 - 16.1.7. The total amount of previous payments received by the Claimant; and
 - 16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
- 16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic’s lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of “labor, materials, or equipment” that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor’s subcontractors, and all other items for which a mechanic’s lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
- 16.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
- 16.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
- 16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
18. A modification, omission, or addition to the terms and conditions of the public work contract, plans, specifications, drawings, or profile, or any defect in the public work contract or in the proceedings preliminary to the letting and awarding of the public work contract does not discharge the surety.
19. Modifications to this Bond are as follows: **[Describe modification or enter “None”]**

ESCROW AGREEMENT

Hopewell Phase I East Infrastructure Project

THIS ESCROW AGREEMENT is made and entered into this _____ day of _____, 20____, by and between the City of Bloomington, Indiana, Board of Public Works (the "Owner"), and _____ (the "Contractor"), and First Financial Bank, an Ohio state chartered bank (the "Escrow Agent"). The Owner and Contractor shall be collectively referred to as the "Parties" herein.

WHEREAS, the Owner and Contractor entered into an Agreement dated the _____ day of _____, 20____, in the amount of \$100,000.00 or more, for the construction of a public works project (the "Construction Agreement"); and

WHEREAS, said Construction Agreement provides that portions of payments by Owner to Contractor shall be retained by Owner (the "Retainage") and shall be placed in the escrow account created hereby.

NOW, THEREFORE, IT IS AGREED AS FOLLOWS:

To the extent that the Owner retains funds out of payments applied for by the Contractor under the provisions of the Construction Agreement providing for payments based on the value of the work in place and the materials stored, the Owner shall place the funds so retained in an escrow account. Such deposit shall be made within three (3) business days after the date such payments are made to Contractor.

The Escrow Agent shall open a "Money Market" account that invests primarily in short-term, interest bearing bank deposit accounts, and/or investment grade securities and deposit said Retainage promptly into the account; however, the Escrow Agent makes no representation as to the yield of such investment and will not bear liability for any delays in depositing the Retainage or for any failure to achieve the maximum possible yield from such Deposit.

The income from and earnings on and all gains derived from the investment and reinvestment of the funds (escrow income) shall be held in the escrow account. The Escrow Agent shall deposit all funds and hold all investments in a specific escrow fund so that a quarterly accounting can and shall be made to the Contractor of all investments made in such funds and all income, fees, payments, deposits, and other activities related to the escrow funds.

The Deposit, less any and all transaction or account fees or charges and out-of-pocket expenses of Escrow Agent attributable to, or incurred in connection with, the deposit thereof in accordance with the terms of this Agreement which items may be deducted by the Escrow Agent from the Deposit as set forth below (such net sum being the "Net Deposit"), will be delivered by Escrow Agent in accordance with the terms of this Escrow Agreement to the person or persons entitled thereto or, herein, to a substitute impartial party or a court of competent jurisdiction. Escrow Agent agrees to provide the Parties with copies of each monthly statement for the Escrow Account for the period for which the Deposit is held by Escrow Agent. As a condition to the delivery of any funds constituting part of the Deposit, Escrow Agent may require from the recipient a receipt therefor and, upon final payment or disposition, may require its release from any liability arising out of the execution or performance hereof,

such release to be in a form reasonably satisfactory to Escrow Agent.

The Escrow Agent shall pay over the net sum held by it hereunder as follows:

The Escrow Agent shall hold all of the escrow funds and shall release the principal, Net Deposit, plus any accrued interest thereon, less any expenses, including but not limited to attorneys' fees, thereof only upon the execution and delivery to it of a Payment Certificate attached here as Exhibit A, executed by the Owner and by the Contractor specifying the portion or portions of the principal of the escrow funds to be released and the person or persons to whom such portions are to be released. After receipt of said Payment Certificate the Escrow Agent shall remit the designated part of escrowed principal and the same proportion of the escrowed income to the person(s) specified in the Payment Certificate. Such release of escrow funds shall be no more than thirty (30) days from the date of receipt by the Escrow Agent of the release executed by the Owner and Contractor.

Although statutorily entitled to a fee, the Escrow Agent agrees to waive the monthly statement fee and the monthly minimum balance.

All income earned on the escrowed principal shall be paid to the Contractor.

In lieu of the presentation of the Payment Certificate described above, any document purporting to be a certificate will be deemed by the Escrow Agent to be a proper certificate, or will suffice as a joint instruction, if it contains: (i) the name of the payee; (ii) the amount of the payment to be made; (iii) the manner of payment (i.e., by certified or cashier's check, by account-to-account transfer, or by wire transfer, whichever is applicable); and (iv) the signatures of each of the Parties hereto, excluding the Escrow Agent.

Escrow Agent will be entitled to rely upon the authenticity of any signature (and upon any facsimile of a signature as if it were an original signature) and the genuineness and/or validity of any writing received by Escrow Agent from either of the Parties pursuant to or otherwise relating to this Escrow Agreement.

Each signatory to this Escrow Agreement warrants that it has full and complete authority to enter into this Escrow Agreement.

The Escrow Agent may at any time request written instructions from the Parties with respect to the interpretation hereof or of action to be taken or suffered or not taken hereunder and, notwithstanding any other provision hereof, will be entitled to withhold (and will not be under any liability to any person for withholding) action hereunder until it has received written instructions signed by all of the Parties.

In the event of the receipt by the Escrow Agent of any notice, demand, or certificate not provided for or in compliance with this Escrow Agreement or of any inconsistent or conflicting notices or certificates, the Escrow Agent will be protected in taking no action whatsoever with reference to any such notice or demand, unless such inaction constitutes gross negligence or willful misconduct on the part of the Escrow Agent. In case of: (i) receipt of contradictory instructions from the Parties; (ii) any dispute as to any matter arising under this Agreement; or (iii) any uncertainty as to the meaning or applicability of any of the provisions hereof, Escrow Agent may, at its option at any time thereafter, deposit the Deposit and/or documents or assets then being held by it in escrow into a court having appropriate jurisdiction, or take such affirmative steps as it may elect in order to substitute an impartial bank of comparable financial and industrial standing to hold the Deposit and/or documents and will thereby be discharged

and relieved of any and all liability hereunder.

The Escrow Agent may resign at any time by giving a minimum of thirty (30) days' prior written notice of resignation to the Parties, such resignation to be effective on the date specified in such notice. The Deposit, and any other assets held by the Escrow Agent under the terms of this Escrow Agreement as of the effective date of the resignation, will be delivered to a successor escrow agent designated in writing jointly by the Parties. If no successor escrow agent has been appointed as of the effective date of the resignation, all obligations of the Escrow Agent hereunder will nevertheless cease and terminate, except that the Escrow Agent's sole responsibility thereafter will be to keep safely the Deposit then held by it and to deliver the same to a person designated by both Parties or in accordance with the direction of a final order or judgment of a court of competent jurisdiction.

The Escrow Agent has no responsibility concerning compliance by the Parties with their duties to each other under this Escrow Agreement or any other agreements. Escrow Agent will have only such duties and obligations as are specifically imposed upon it by the terms and conditions of this Escrow Agreement and no implied duties or obligations will be read into this Escrow Agreement against Escrow Agent.

The Parties, jointly and severally, agree to indemnify and hold harmless Escrow Agent from and against any and all costs including its attorney's fees, claims or damages howsoever occasioned that may be incurred by Escrow Agent acting under this Escrow Agreement or to which Escrow Agent may be put in connection with Escrow Agent acting under this Escrow Agreement arising from the Parties' willful misconduct or negligence.

In the absence of such a joint written authorization and in the absence of the termination of the Contractor as provided above, the escrowed funds shall be paid in the manner directed by a certified copy of a judgment of a court of record establishing the rights of the parties to said funds.

The account shall be a commercial money market account set up by the Escrow Agent to hold the retainage, and there shall be no fees and no minimum balance required. The account shall earn interest rate based on balances. The Parties agree to reimburse Escrow Agent for all reasonable expenses, disbursements and advances incurred or made by Escrow Agent in the performance of its duties hereunder (including reasonable fees, expenses and disbursements of its counsel).

The Escrow Agent will not be required to use its own funds in the performance of any of its obligations or duties or the exercise of any of its rights or powers, and will not be required to take any action which in Escrow Agent's reasonable judgment would cause it to incur expense or liability unless furnished with security and indemnity which it reasonably deems to be satisfactory.

This Agreement and anything done or performed hereunder by either the Contractor or Owner shall not be construed to prejudice or limit the claims which either party may have against the other arising out of the aforementioned Construction Agreement.

This instrument constitutes the entire agreement between the Parties regarding the duties of the Escrow Agent with respect to the investment and payment of escrow funds. The Escrow Agent is not liable to the Owner and Contractor for any loss or damages, other than loss or damage directly caused by Escrow Agent's own gross negligence or willful misconduct.

This Escrow Agreement may be amended, modified, superseded, cancelled, renewed or extended, and

the terms or covenants hereof may be waived only by a written instrument executed by all the Parties hereto.

This Escrow Agreement contains the entire agreement between the Parties with respect to the escrow transaction contemplated herein and may not be changed or terminated orally.

This Escrow Agreement shall be governed by the laws of the State of Indiana.

This Escrow Agreement will be binding upon and inure solely to the benefit of the Parties hereto and their respective heirs, administrators, successors and assigns, and will not be enforceable by or inure to the benefit of any third party, except any successor escrow agent. No party may assign any of its rights or obligations under this Escrow Agreement without the written consent of the other parties, except that either of the Parties may assign its rights and obligations hereunder in connection with a permitted assignment of its rights and obligations under the Agreement in which case any signatures required hereunder will be those of such assignee.

This Escrow Agreement may be executed in any number of counterparts and by different parties hereto in separate counterparts, each of which when so executed will be deemed to be an original and all of which taken together will constitute one and the same agreement. Any party so executing this Agreement by facsimile transmission shall promptly deliver a manually executed counterpart, provided that any failure to do so shall not affect the validity of the counterpart executed by facsimile transmission.

All notices, waivers, consents, approvals and other communications hereunder shall be in writing and shall be deemed to have been properly given on the date of service if delivered personally or on the date of mailing if deposited in the United States mail, first class postage prepaid, to the extent required by applicable law, and will comply with the requirements of the Uniform Commercial Code then in effect, addressed appropriately as follows:

If to Owner:

City of Bloomington Board of Public Works
401 N. Morton Street, Suite 130
Bloomington IN 47404
Attn: Andrew Cibor, City Engineer

If to Escrow Agent:

First Financial Bank
536 N. College Ave.
Bloomington, IN 47404
Attn: Amy Kaiser, Vice President, Treasury Management Services

If to Contractor:

Name: _____
Address: _____
City/State: _____
Attn: _____

In Witness Whereof, the undersigned have executed this Escrow Agreement as of the day and year first above written.

OWNER:

City of Bloomington, Board of Public Works

By: _____
Kyla Cox Deckard, President

Reviewed and Approved By:

Jeffrey Underwood, Controller
City of Bloomington

Dated: _____

CONTRACTOR:

By: _____

Printed Name: _____

Title: _____

Tax I.D. No.: _____

ESCROW AGENT:

First Financial Bank

By: _____
Amy Kaiser, Vice President,
Treasury Management Services

AUTHORIZATION TO RELEASE ESCROW FUNDS

(Date)

First Financial Bank
536 N. College Avenue
Bloomington, IN 47404

Attn: Amy Kaiser, Vice President, Treasury Management Services

Ladies and Gentlemen:

Pursuant to that certain Escrow Agreement dated as of _____, 20____, by and among you as Escrow Agent and the undersigned (the "Escrow Agreement"), the undersigned hereby jointly notify and instruct you to issue a check for the balance in the Escrow Account as follows:

Escrow Account for Retainage on Project: _____
Account Holder/Contractor: _____
Primary Account Number: _____

The undersigned, in consideration of the release of funds being held by Escrow Agent, and other good and valuable consideration, receipt of which is hereby acknowledged, hereby release, acquit and forever discharge the Escrow Agent, and its employees, officers, directors, agents, accountants, attorneys and parent companies, and all directors, agents, accounts and attorneys of such parent companies and all employees, officers, and heirs, executors, administrators, successors and assigns of all of the foregoing, jointly and severally (collectively, the "Bank Parties"), of and from all and any manner of action, actions, cause and causes of action, suits, debts, dues, sums of money, accounts, bonds, bills, covenants, contracts, agreements, promises, obligations, defenses, offsets, counterclaims, damages, judgments, claims, demands and liabilities of any kind or character whatsoever, known or unknown, suspected or unsuspected, in contract or in tort, in law or in equity, that any one or more of the undersigned had, have, may have or may in the future have against any one or more of the Bank Parties arising out of, for or by reason of or resulting from or in any way related, directly or indirectly, to the Escrow Agreement. In addition, the undersigned, jointly and severally, agree not to commence, aid, cause, permit, join in, prosecute or participate in any suit or other proceeding in a position which is adverse to any of the Bank Parties, which suit or proceeding arises from or relates to, in whole or in part, directly or indirectly, any of the foregoing matters.

Sincerely,

THE ESCROW PARTIES:

The City of Bloomington

Contractor

By: _____
Andrew Cibor, City Engineer
City of Bloomington

By: _____
Printed Name: _____
Title: _____

Reviewed and Approved By:

Jeffrey Underwood, Controller
City of Bloomington

Escrow Agent
First Financial Bank

Dated: _____

By: _____
Amy Kaiser, Vice President,
Treasury Management Services

SECTION IV

AFFIRMATIVE ACTION PLAN REQUIREMENTS

Updated November 14, 2022

To: Prospective Bidders/Vendors/Grant recipients

RE: Affirmative Action, Harassment Policy, Living Wage Ordinance, and Drug Testing Policy

FROM: Audrey Brittingham, Assistant City Attorney/Contract Compliance Officer

AFFIRMATIVE ACTION: All bidders, vendors, and grant recipients with the City of Bloomington for projects in excess of \$10,000.00 must submit an affirmative action plan to the City Legal Department. This plan must ensure applicants and employees are treated in a manner that provides equal employment opportunity and tends to eliminate inequality based upon race, religion, color, sex, national origin, ancestry, disability, sexual orientation, gender identity, veteran status and/or housing status.

Even if your company already has a plan on file with the City, you must check with City Legal Department to make sure it complies with the City's current requirements, including having a workforce breakdown form that is no more than six months out of date. If you already have a plan, but it does not cover all of the City's current requirements, you may submit a separate supplement with your plan to fill any gaps.

You must submit your written affirmative action plan (or supplement) to City Legal **at least twenty-four hours** before the bid, quote, or proposal deadline. You must submit your plan to the Legal Department **separately** from your bid or quote. Twenty-four hours will give legal sufficient time to review your and the other plans. I recommend you submit your affirmative action plan to the Legal Department earlier, if possible, so there will be sufficient time to work out any problems that may be in your plan. Bidders who fail to submit acceptable plans by the deadline are subject to disqualification.

We strongly advise you to confirm that the City Legal Department has received your plan and that it meets our requirements well before the submittal deadline. We will make every effort to work with you to clear up any problems. However, it remains your responsibility to confirm that we have received your plan and that it complies with our requirements. If you fail to confirm that we have received and approved your plan, you risk losing your eligibility to submit a bid or quote. We will be glad to provide a receipt upon request. Please let us know if you want a receipt when you submit your plan.

You must ensure all of the required protected classes listed above are included in your plan. In addition to other requirements, your plan **MUST** include a current workforce breakdown, an internal grievance procedure, a non-retaliation statement, designation of a person by name or position who is responsible for implementing the plan, applicability to both applicants and employees, recruitment of minorities, equal access to training programs, and an explanation of your methods of communicating the operations of your affirmative action plan to your employees and prospective applicants.

Accompanying this letter you will find the following materials:

1. A workforce breakdown form. You **MUST** submit a workforce breakdown form (sometimes called a "utilization report") with your affirmative action plan. This form is provided for your convenience. If you already have a current form you have completed for another jurisdiction that includes the same type of information, you may submit a copy of that form instead of using our form. Your workforce breakdown data cannot be more than six months old. Even if you already have an acceptable

affirmative action plan on file with the City, you should submit a new workforce breakdown each time you bid for a city contract, to be sure we have up-to-date figures.

2. An affirmative action plan checklist. We will use this checklist to review your affirmative action plan. If you compare your plan with this list, you should be able to tell whether your plan fulfills the City's requirements. If your plan omits any elements on the checklist, your plan will not be approved.
3. A sample affirmative action plan that you may amend and adopt as your own.

These documents may be useful if your company has not designed an affirmative action plan before. Feel free to adopt this plan as your own or to amend it to meet your needs.

Additional materials, such as the City of Bloomington's Contract Compliance Regulations, are available from the Legal Department upon request.

HARASSMENT POLICY: All bidders and vendors required to submit an affirmative action plan now must also submit a harassment plan. The harassment plan must, at minimum, include a definition of harassment, the name or title of the individual designated to receive and investigate complaints and a statement that the contractor will not retaliate against an employee for complaining about harassment. A model harassment policy is included for your convenience as part of our attached model affirmative action plan, which you may amend and adapt as your own. **Please note that this harassment policy requirement is fairly new, adopted by the Bloomington Common Council in June, 2019.**

LIVING WAGE: Contractors that are considered "covered employers" under City Ordinance 2.28, otherwise known as the "Living Wage Ordinance" or "LWO," are required to pay their covered employees at least a living wage. Currently, the living wage is \$15.29 per hour for covered employees, and up to 15% of that amount, or \$2.29, may be in the form of the covered employer's contribution to health insurance available to the covered employee.

If the City determines the successful bidder is a covered employer under the LWO, Contractor shall execute the Living Wage Ordinance Affidavit; shall abide by the LWO by paying their employees a living wage and providing the City with information requested in the course of enforcing the LWO; and shall post the Living Wage Poster, provided by the City Legal Department, in areas frequented by their covered employees.

The attached flow chart provides guidance on whether the contractor is a "covered employer." If you have questions, please contact Audrey Brittingham at audrey.brittingham@bloomington.in.gov, or call 812-349-3426.

DRUG TEST POLICY: Finally, please be aware that if you are submitting a bid for a public works project with an estimated cost of \$150,000.00 or more, you will need to submit your company's written drug testing plan with your bid. Your plan must comply with I.C. 4-13-18-1. Failure to do so may make you ineligible to be awarded a bid or contract. Please see your bid packet for more details.

If you have any questions, contact the City's Legal Department at 812.349.3426 or email the City at legal@bloomington.in.gov. The office hours are Monday through Friday, 8-5.

Thank you.

Model Affirmative Action Plan and Harassment Policy

_____, declares its policy to provide equal opportunity in employment, training and advancement, and to administer its employment practices without regard to race, color, religion, sex, national origin, ancestry, disability, sexual orientation, gender identity, veteran status, or housing status. Our policy of nondiscrimination will prevail throughout every aspect of our employment practices, including recruitment, hiring, training and all other terms and conditions of employment. We shall implement this affirmative action plan to make it widely known that equal employment opportunities are available on the basis of individual merit. We shall survey and analyze our employment workforce annually to determine what steps, if any, are needed to conform effectively to this equal employment policy.

Responsible Officer

Mr. or Ms. _____ (or the _____ officer) is the equal employment opportunity officer for our company and is responsible for implementing this affirmative action policy.

Publication of Policy

Our employees will be made aware of our commitment to affirmative action through the following procedures:

- posting notices on employee bulletin boards,
- including our policy statement and plan in our personnel manual,
- regularly sending out notices of our policy in paycheck envelopes, and/or
- training supervisors to recognize discriminatory practices.

We will make potential employees aware of our policy through the following procedures:

- including the words "Equal Opportunity Employer" in all of our advertisements and notices for job openings,
- notifying employment agencies about our commitment, and
- sending notice of our policy to unions.

Implementing Our Policy

Our affirmative action plan will be implemented by widening our recruitment sources. We shall advertise in newspapers and other media that reach people in protected classes. We shall send job notices to schools with large percentages of students in the protected classes and to local groups that serve these classes.

We shall examine our hiring practices periodically to insure that we consider only job-related qualifications in filling our positions. We shall discard irrelevant educational requirements and unnecessary physical requirements. We shall ask only job-related questions on our employment applications.

We shall keep affirmative action information on each applicant who voluntarily provides this information, but separate from his or her application. We shall keep records on our hiring decisions to evaluate the success of our affirmative action measures. We shall decide placement, duties, benefits, wages, training prospects, promotions, layoffs and terminations without regard to race, sex, religion, color, national origin, ancestry, disability, sexual orientation, gender identity, veteran status or housing status.

GRIEVANCE PROCEDURE

If an employee or applicant feels she or he has been discriminated against on the basis of race, sex, religion, color, national origin, ancestry, disability, sexual orientation, gender identity, veteran status or housing status, she or he may bring the complaint to her or his immediate supervisor. If the complaint is not resolved readily at that level, she or he may submit it to _____ (personnel officer, corporate president, other) who will make a final decision on its validity. This grievance process does not preclude him or her from complaining to local, state or federal civil rights agencies. We will not retaliate against an employee or applicant for voicing a grievance or for filing a complaint with the appropriate agency.

Our current workforce breakdown is shown on the attached form.

Policy prohibiting harassment in the workplace

It is the policy of _____ (company name) to maintain a workplace free of harassment on the basis of race, sex, color, ancestry, national origin, religion, disability, age, sexual orientation, gender identity, housing status or veteran status. Harassment, as defined herein, is strictly prohibited in the workplace, and is punishable by appropriate discipline up to and including termination.

Harassment means any unwelcome or offensive conduct, whether written, verbal or physical, which is

- (a) directed at or to an employee because of his or her actual or perceived race, sex, color, ancestry, national origin, religion, disability, age, sexual orientation, gender identity, housing status or veteran status or
- (b) directed toward any person concerning an individual, or a class of individuals, because of the race, sex, color, ancestry, national origin, religion, disability, age, sexual orientation, gender identity, housing status or veteran status of the individual or class of individuals. For example, racial or ethnic slurs or derogatory epithets are prohibited in the workplace, regardless of whether a member of the racial or ethnic group is present when the statement is made.

Harassment does not refer to occasional compliments or other statements of a socially acceptable nature. Harassment refers to behavior which is unwelcome and which is offensive and/or persistent enough to create, or has the potential of creating an intimidating, hostile or offensive working environment for any employee. Harassment includes unwelcome sexual advances or requests for sexual favors, unwelcome touching of a sexual nature and unwelcome and/or offensive sexual comments.

1. This policy applies to all full-time, part-time, permanent and temporary employees, including supervisors and department heads, as well as to volunteers.
2. It is a violation of this policy to use an individual's submission to or rejection of harassing conduct as the basis for any employment decision affecting the individual.
3. An employee who believes she, he or they have been subjected to harassment as defined in this policy shall promptly report the harassment to her, his or their supervisor and/or the director of human resources or designee. _____ (company name) will make reasonable efforts to insure that a human resources representative of each sex is available to receive such complaints. The human resources department shall conduct a thorough and prompt investigation and, if appropriate, take disciplinary action against any offender, including but not limited to discharge. Staff will keep the complaint as confidential as reasonably possible. No one will be retaliated against for filing a harassment complaint.
4. All supervisory personnel who observe or otherwise learn of or have reason to suspect any conduct which may violate this policy shall promptly report such facts to the director of human resources or designee, and shall cooperate fully in any investigation or disciplinary action undertaken pursuant to this policy. Failure to

comply with this section shall be grounds for appropriate disciplinary action, up to and including termination.

5. _____ (company name) will provide regular training to employees and supervisors on the subject of harassment in the workplace. We will include information about this policy in our orientation and in our personnel policy. A copy of this policy will be posted on a prominent bulletin board. We take this matter seriously and will do all that is reasonably necessary to maintain a harassment-free workplace for our employees.

Signature

Date

WORKFORCE BREAKDOWN FORM

COMPANY NAME: _____

ADDRESS: _____

REPRESENTATIVE: _____

PHONE: _____

E-MAIL ADDRESS: _____

Position, Title Class or Category	Total Number Employees in Each Position	Total Number Minority Employees	Percent of Total	Total Number Female Employees	Percent of Total	Total Number Employee s with Disabilitie s	Percent of Total

I swear or affirm under penalties of perjury that this workforce breakdown is accurate, to the best of my knowledge.

Signature and Title of Representative: _____

Date: _____

AFFIRMATIVE ACTION PLAN AND HARASSMENT POLICY CHECKLIST

Company Name: _____

Effective Date: _____

NOTE: This is **not** an Affirmative Action Plan

Contractor: Plan MUST Include:		Yes	No	Comments:
Policy statement of equal employment opportunity		<input type="checkbox"/>	<input type="checkbox"/>	
Covers:	Applicants for employment	<input type="checkbox"/>	<input type="checkbox"/>	
	Employees	<input type="checkbox"/>	<input type="checkbox"/>	
On basis of:	Race	<input type="checkbox"/>	<input type="checkbox"/>	
	Religion	<input type="checkbox"/>	<input type="checkbox"/>	
	Color	<input type="checkbox"/>	<input type="checkbox"/>	
	Sex	<input type="checkbox"/>	<input type="checkbox"/>	
	National Origin	<input type="checkbox"/>	<input type="checkbox"/>	
	Ancestry	<input type="checkbox"/>	<input type="checkbox"/>	
	Disability	<input type="checkbox"/>	<input type="checkbox"/>	
	Sexual Orientation	<input type="checkbox"/>	<input type="checkbox"/>	
	Gender Identity	<input type="checkbox"/>	<input type="checkbox"/>	
	Veteran Status	<input type="checkbox"/>	<input type="checkbox"/>	
	Housing Status	<input type="checkbox"/>	<input type="checkbox"/>	
Designates a person responsible for implementation of the Plan		<input type="checkbox"/>	<input type="checkbox"/>	
Provides for communication of the policy:				
	Within the Organization	<input type="checkbox"/>	<input type="checkbox"/>	
	Outside the Organization (e.g., recruitment sources, unions)	<input type="checkbox"/>	<input type="checkbox"/>	
Applies to all terms and conditions of employment (e.g., hiring, placement, promotion, duties, wages, benefits, use of facilities, layoff, discipline, termination)		<input type="checkbox"/>	<input type="checkbox"/>	
Provision for: Recruitment from minority groups		<input type="checkbox"/>	<input type="checkbox"/>	
Provision for: Equal access to training programs		<input type="checkbox"/>	<input type="checkbox"/>	
Grievance Procedure		<input type="checkbox"/>	<input type="checkbox"/>	
Prohibits retaliation for filing grievances		<input type="checkbox"/>	<input type="checkbox"/>	
Workforce Breakdown (figures up to date within 6 months)		<input type="checkbox"/>	<input type="checkbox"/>	

HARASSMENT POLICY CHECKLIST

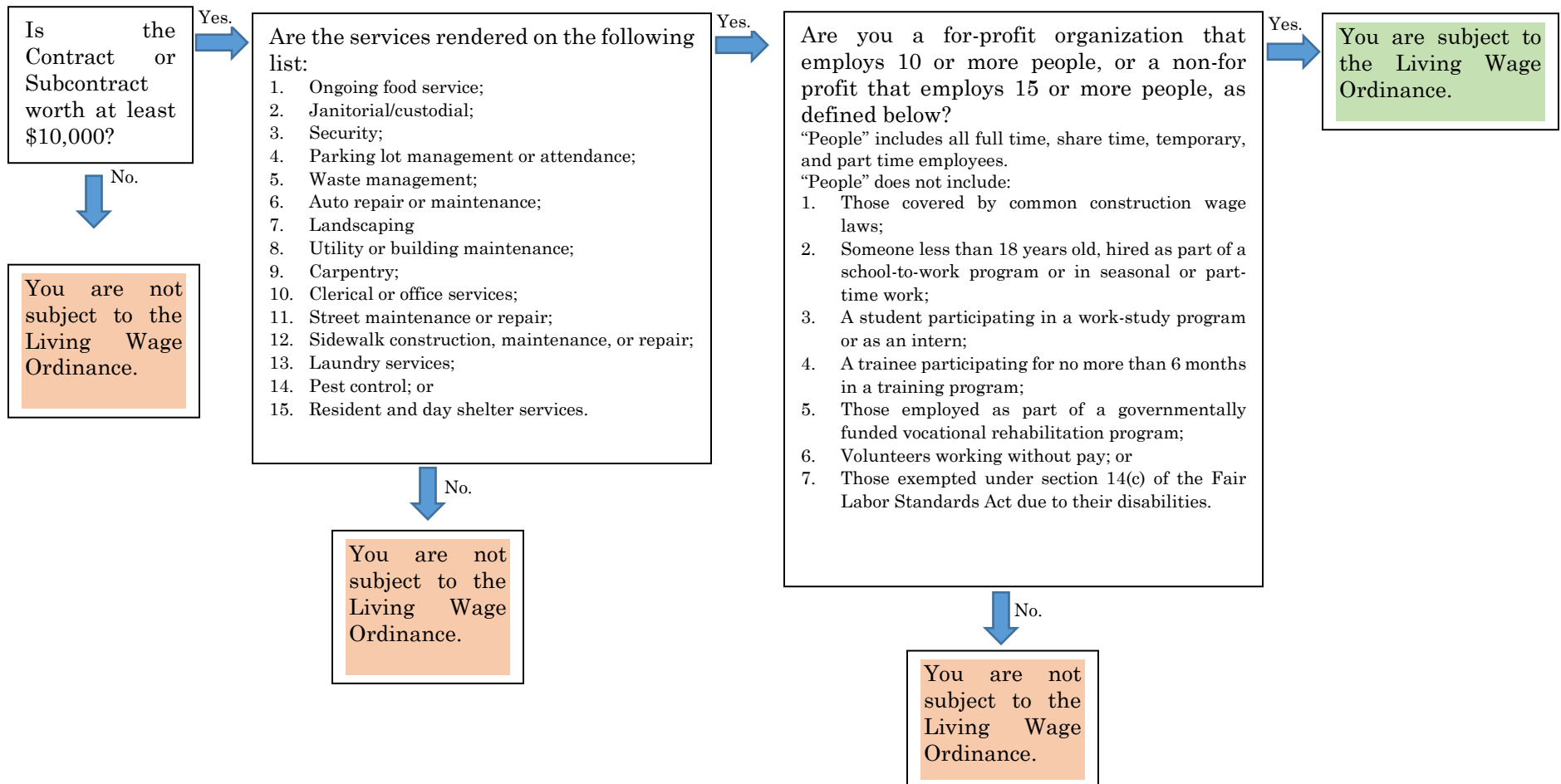
Definition of harassment	<input type="checkbox"/>	<input type="checkbox"/>
Designates a person to receive and Investigate harassment complaints	<input type="checkbox"/>	<input type="checkbox"/>
Prohibits retaliation for filing a harassment complaint	<input type="checkbox"/>	<input type="checkbox"/>

The City of Bloomington (CoB) Living Wage Ordinance (LWO) applies to three groups of employers:

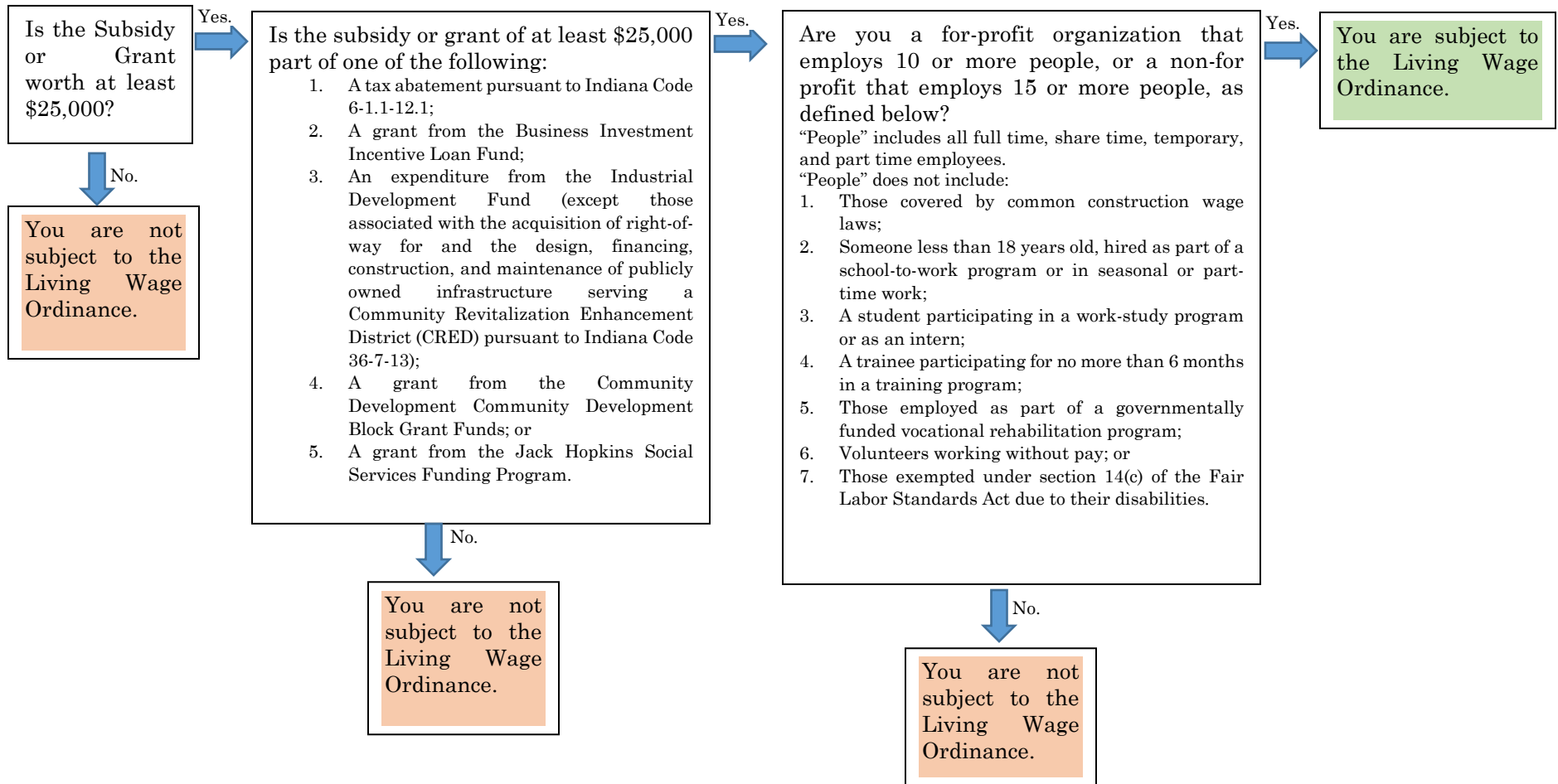
- 1) The CoB;
- 2) Companies that provide services to the CoB through contracts or subcontracts; or
- 3) Organizations that receive CoB subsidies or grants.

As an employer under categories 2 or 3, you may or may not be subject to the LWO. To find out, follow the applicable flow chart, below, or contact the City Legal Department.

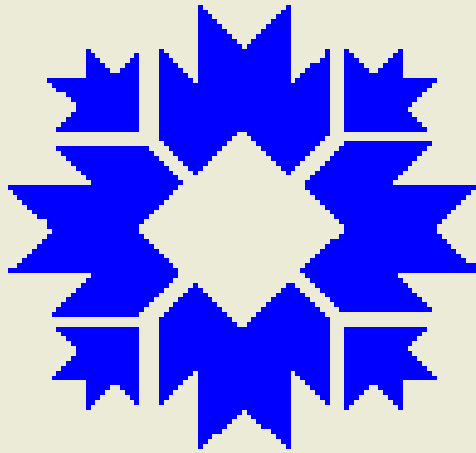
Companies that Provide Services to the CoB through Contracts or Subcontracts (“Agreement”)



Companies or Organizations that Receive CoB Subsidies or Grants



NOTICE TO ALL EMPLOYEES WORKING ON CITY-RELATED PROJECTS



LIVING WAGE

Your employer may be required to pay you a living wage pursuant to the Bloomington Living Wage Ordinance. There are some exceptions.

If you believe you are not receiving the required pay, contact the Living Wage Ordinance Contract Compliance Officer at the City of Bloomington Legal Department, 812-349-3426 or at legal@bloomington.in.gov.

SECTION V

STATE FORM NO. 96
QUESTIONNAIRE/NON-COLLUSION AFFIDAVIT
REQUEST FOR TAXPAYER IDENTIFICATION NUMBER AND CERTIFICATION



CONTRACTOR'S BID FOR PUBLIC WORK- FORM 96

State Form 52414 (R2 / 2-13) / Form 96 (Revised 2013)

Prescribed by State Board of Accounts

PART I

(To be completed for all bids. Please type or print)

Date (month, day, year): _____

1. Governmental Unit (Owner): _____

2. County: _____

3. Bidder (Firm): _____

Address: _____

City/State/ZIP code: _____

4. Telephone Number: _____

5. Agent of Bidder (if applicable): _____

Pursuant to notices given, the undersigned offers to furnish labor and/or material necessary to complete the public works project of _____

(Governmental Unit) in accordance with plans and specifications prepared by _____

_____ and dated _____ for the sum of

_____ \$ _____

The undersigned further agrees to furnish a bond or certified check with this bid for an amount specified in the notice of the letting. If alternative bids apply, the undersigned submits a proposal for each in accordance with the notice. Any addendums attached will be specifically referenced at the applicable page.

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 contractor and his subcontractors, 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 subcontractors employed by me for this project will use U.S. steel products on this project if awarded. I understand that violations hereunder may result in forfeiture of contractual payments.

ACCEPTANCE

The above bid is accepted this _____ day of _____, subject to the following conditions: _____

Contracting Authority Members:

_____	_____
_____	_____
_____	_____

PART II

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

Governmental Unit: _____

Bidder (Firm) _____

Date (month, day, year): _____

These statements to be submitted under oath by each bidder with and as a part of his 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	Expected 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 work, complete the project, number of workers, etc. and any other information which you believe would enable the governmental unit to consider your bid.)*

2. Please list the names and addresses of all subcontractors *(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 subcontractor.

3. If you intend to sublet any portion of the work, state the name and address of each subcontractor, equipment to be used by the subcontractor, 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 governmental unit in the event that you subsequently determine that you will use a subcontractor on the proposed project.

4. What equipment do you have available to use for the proposed project? Any equipment to be used by subcontractors may also be required to be listed by the governmental unit.

5. Have you entered into contracts or received offers for all materials which substantiate the prices used in preparing your proposal? If not, please explain the rationale used which would corroborate the prices 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 governing body awarding the contract must be specific enough in detail so that said governing body can make a proper determination of the bidder's capability for completing the project if awarded.

SECTION IV CONTRACTOR'S NON- COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that he or she has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him or her, 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 include 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.

He or she further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee, gift, commission or thing of value on account of such sale.

SECTION V OATH AND AFFIRMATION

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

Dated at _____ this _____ day of _____

(Name of Organization)

By _____

(Title of Person Signing)

ACKNOWLEDGEMENT

STATE OF _____)
) ss
COUNTY OF _____)

Before me, a Notary Public, personally appeared the above-named _____ and swore that the statements contained in the foregoing document are true and correct.

Subscribed and sworn to before me this _____ day of _____

Notary Public

My Commission Expires: _____

County of Residence: _____

My Commission #: _____

BID OF

(Contractor)

(Address)

FOR

PUBLIC WORKS PROJECTS

OF

Filed _____

Action taken _____



**JOHN HAMILTON
MAYOR**

SUBSTITUTE W-9 & BANK/EFT FORM

CITY OF BLOOMINGTON CONTROLLER'S OFFICE

401 N Morton St
Post Office Box 100
Bloomington IN 47402

p 812.349.3412
f 812.349.3456
controller@bloomington.in.gov

REQUEST FOR TAXPAYER IDENTIFICATION NUMBER AND CERTIFICATION: SUBSTITUTE W-9																										
Name (as shown on your tax return):																										
Business Name/DBA (if different than above):																										
Check appropriate box for federal tax classification: <input type="checkbox"/> Individual/sole proprietor <input type="checkbox"/> C Corporation <input type="checkbox"/> S Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Trust/estate <input type="checkbox"/> Limited liability company. <u>Enter the tax classification</u> (C=C corporation, S=S corporation, P=Partnership) ▶ _____ <input type="checkbox"/> Other ▶ _____		Exemptions: Exempt payee code (if any) _____ Exemption from FATCA reporting code (if any) _____																								
Address (number, street, and apt. or suite no.):																										
City, State, and ZIP code:																										
Telephone number:	Fax number:	Email:																								
Check all that apply: <input type="checkbox"/> State or Local Government <input type="checkbox"/> City Employee <input type="checkbox"/> Contractual Employee <input type="checkbox"/> Farmer's Market Vendor <input type="checkbox"/> Not for Profit - 501(c)																										
List city department(s) you are doing business with (Parks, Fire, Utilities etc.):		Commodities or Services provided:																								
		Primary NAICS Code: _____ DUNS #: _____																								
Taxpayer Identification Number (TIN) Enter your TIN in the appropriate box. The TIN provided must match the name given on the "Name" line To avoid backup withhold. For individuals, this is your social security number (SSN). However, for a Resident alien, sole proprietor, or disregarded entity, see the Part 1 instructions on page 3 of IRS Form W-9. For other entities, it is your employer identification number (EIN). If you do not have a number, see <i>How to get a TIN</i> on page 3 of IRS Form W-9 Note: If the account is in more than one name, see the instructions for line 1 and the chart on page 4.		Social security number <table border="1"> <tr> <td> </td><td> </td><td> </td><td>-</td><td> </td><td> </td><td> </td><td>-</td><td> </td><td> </td><td> </td><td> </td> </tr> </table> Employer identification number <table border="1"> <tr> <td> </td><td> </td><td> </td><td>-</td><td> </td><td> </td><td> </td><td>-</td><td> </td><td> </td><td> </td><td> </td> </tr> </table>				-				-								-				-				
			-				-																			
			-				-																			

Certification

Under penalties of perjury, I certify that:

- The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
- I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
- I am a U.S. person or other U.S. person (defined below), and
- The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification Instructions

You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 3 of the IRS Form W-9.

Please mail or fax this complete form as soon as possible to the Controller's Office using the contact information above.
NO PAYMENTS WILL BE SENT UNTIL THIS FORM IS RECEIVED.

SIGN HERE	Signature of U.S. person ▶	Date ▶
----------------------	-------------------------------	--------



CITY OF BLOOMINGTON ELECTRONIC FUNDS TRANSFER FORM (EFT)

THE CITY'S REQUIRED METHOD OF PAYMENT IS EFT
 (Electronic Funds Transfer)
 PLEASE COMPLETE THE SECTION BELOW TO ENROLL

EFT INFORMATION

Bank Name:	
Type of Account:	<input type="checkbox"/> Checking <input type="checkbox"/> Savings
Routing Number:	
Account Number:	
Name of Account:	
Email for Payment Notification:	

REFERENCES FOR SOLE PROPRIETORS & PARTNERSHIPS

Name:	Address:
Phone:	Email:
Name:	Address:
Phone:	Email:
Name:	Address:
Phone:	Email:

BILLING INFORMATION

Payment Remittance		
Address (PO Box)		
Address (Physical)		
City	State	Zip
Person to Contact		
Email		
Phone		

SECTION VI

GENERAL CONDITIONS

GENERAL CONDITIONS

For

Construction

INDEX TO THE ARTICLES OF THE GENERAL CONDITIONS

DEFINITIONS	CHANGES IN CONTRACT PRICE
EXECUTION OF DOCUMENTS	CHANGE OF CONTRACT TIME
CORRELATION, INTERPRETATION AND INTENT OF DOCUMENTS	LIQUIDATED DAMAGES
AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS	WARRANTY AND GUARANTEE: TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK.
BONDS AND INSURANCE	PAYMENTS AND COMPLETION.
CONTRACTOR'S RESPONSIBILITIES	SUSPENSION OF WORK AND TERMINATION.
WORK BY OTHERS	ARBITRATION.
OWNER'S RESPONSIBILITIES	ENVIRONMENTAL REQUIREMENTS.
ENGINEER'S RESPONSIBILITIES DURING CONSTRUCTION	MISCELLANEOUS.
CHANGES IN THE WORK	

1.00 DEFINITIONS. The Owner, the Contractor and the Engineer, are those mentioned as such in the Agreement. They are treated throughout the Contract Documents as if each were of the singular number and masculine gender. Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1.01. ADDENDA. Written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the Contract Documents, by additions, deletions, clarifications, or corrections. Addenda will become part of the Contract Documents when the Agreement is executed.

1.02. AGREEMENT. The contractual agreement between the Contractor and the Owner.

1.03. APPLICATION FOR PAYMENT. The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents..

1.04. BID. The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

1.05. BIDDER. Any person, firm, or corporation submitting a Bid for the Work.

1.06. BOARD. The City of Bloomington Board of Public Works.

- 1.07. BONDS.** Bid, performance, and payment bonds and other instruments of security, furnished by the Contractor and his surety in accordance with the Contract Documents.
- 1.08. CALENDAR DAY.** Every day shown on the calendar.
- 1.09. CHANGE ORDER.** A written order to the Contractor signed by the Owner authorizing an addition, deletion, or revision in the Work, or an adjustment in the Contract Price or the Contract Time issued after execution of the Agreement.
- 1.10. CONTRACT.** The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Engineer and the Contractor, (2) between the Owner and a Subcontractor or Sub subcontractor, or (3) between any persons or entities other than the Owner and Contractor.
- 1.11. CONTRACT DOCUMENTS.** The Agreement, Addenda (whether issued prior to the opening of Bid or the execution of the Agreement), Change Orders issued by the Owner or Engineer, Invitation to Bidders, Instructions to Bidders, Proposal, Non-Collusion Affidavit, Questionnaire, Contractor's Bid, the Bonds, Employment Requirements and Wage Rates, Notification Procedures, General Equipment Stipulations, the Notice of Award, the Notice to Proceed, these General Conditions, the Special Conditions, the Specifications, Drawings, and Modifications.
- 1.12. CONTRACT PRICE.** The total amount payable to the Contractor under the Contract Documents.
- 1.13. CONTRACT TIME.** The number of days stated in the Agreement for the completion of the Work, computed as provided in these General Conditions; or by the date set forth in the Agreement.
- 1.14. CONTRACTOR.** The person, firm, or corporation with whom the Owner has executed the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative. The relationship of the Contractor to the Owner shall be that of an independent contractor.
- 1.15. DAY.** A calendar day of twenty-four hours measured from midnight to the next midnight.
- 1.16. DATE OF CONTRACT.** The date written in the first paragraph of the Contract Agreement.
- 1.17. DRAWINGS OR PLANS.** The graphic and pictorial portions of the Contract Documents, wherever located or whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.
- 1.18. ENGINEER.** The Traffic and Transportation Engineer (herein after "City Engineer", or "Engineer"), person, firm, or corporation named by the Owner "the City of Bloomington", or the duly authorized agents of the Engineer, acting within the scope of the duties entrusted to them.

- 1.19. FIELD ORDER.** A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
- 1.20. MODIFICATION.** (a) A written amendment of the Contract Documents signed by both parties. (b) A Change Order. (c) A written clarification or interpretation issued by the Engineer. (d) A written order for a minor change or alteration in the Work issued by the Engineer. A Modification may be issued only after execution of the Agreement.
- 1.21. NOTICE OF AWARD.** The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
- 1.22. NOTICE TO PROCEED.** A written notice given to the Contractor by the Owner (with a copy to the Engineer) fixing the date on which the Contract Time will commence to run and on which the Contractor shall start to perform his or her obligations under the Contract Documents.
- 1.23. OWNER.** The City of Bloomington named and designated in the Agreement as "Owner" acting through its Board of Public Works and its authorized agents. All notices, letters, and other communication directed to the Owner shall be addressed and delivered to the Office of the City Engineer, 401 North Morton, Suite #130, Bloomington, Indiana, 47404.
- 1.24. PROGRESS SCHEDULE.** A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
- 1.25. PROJECT.** The total construction of which the Work performed under the Contract Documents may be the whole or a part, and which may include construction by the Owner or by separate contractors.
- 1.26. RESIDENT PROJECT REPRESENTATIVE.** The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
- 1.27. RESPONSIBLE BIDDER.** One who is fully capable of performing the contract requirements and who has the integrity and reliability to insure faithful performance.
- 1.28. RESPONSIVE BIDDER.** One who has submitted a Bid conforming in all material respects to the Contract Documents.
- 1.29. SHOP DRAWINGS.** All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, manufacturer, supplier or distributor and which illustrate the equipment, material or some portion of the Work.
- 1.30. SPECIFICATIONS.** Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work, and performance of related services.

1.31. SUBCONTRACTOR. An individual, firm, or corporation having a direct contact with the Contractor or with any other Subcontractor for the performance of a part of the Work to a special design at the site, but does not include a firm which merely furnishes material. All Subcontractor's performing work having a value over \$10,000.00 must be approved prior to performing any work under this contract agreement. Any work performed without prior approval will not be compensated for.

1.32. SUBSTANTIAL COMPLETION. The date as determined by the Engineer when the construction of the Project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the Project or specified part can be utilized for the purposes for which it was intended; or if there be no such determination, the date of final completion.

1.33. WORK. Any and all obligations, duties, and responsibilities necessary to the successful completion of the Project assigned to, or undertaken by, the Contractor under the Contract Documents, including all labor, materials, equipment, and other incidentals, and the furnishing thereof.

1.34. WORK CHANGE DIRECTIVE.—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.35. MISCELLANEOUS DEFINITIONS

1.35.1. AS ORDERED, AS DIRECTED, AS REQUIRED, AS PERMITTED, AS ALLOWED. The order, directions, requirement, permission, or allowance of the Owner or Engineer is intended only to the extent of judging compliance with the Contract Documents. The terms do not imply that the Owner or Engineer has any authority or responsibility for supervision of the Contractor's forces or construction operations. Such supervision is the sole responsibility of the Contractor.

1.35.2. REASONABLE, SUITABLE, ACCEPTABLE, PROPER, SATISFACTORY. The terms reasonable, suitable, acceptable, proper, and satisfactory mean such to the Owner or Engineer and are intended only to the extent of judging compliance with the Contract Documents.

1.35.3. UNDERSTOOD AND AGREED. Whenever in these Contract Documents the expression "it is understood and agreed" or an expression of like import is used, such expression means the mutual understanding and agreement of the parties executing the Contract Agreement.

2.00. EXECUTION OF AGREEMENT.

2.01. EXECUTION OF AGREEMENT. The Agreement and other Contract Documents will be executed as set forth in the Special Conditions.

2.02. DELIVERY OF BONDS AND EVIDENCE OF INSURANCE. When the executed Agreements are delivered to the Owner, the Contractor shall also deliver to the Owner such Bonds and evidence of insurance as he or she may be required to furnish in accordance with the Agreement.

2.03. COPIES OF DOCUMENTS. The Owner, upon request from the Contractor, shall furnish to the Contractor the number of copies of the Contract Documents set forth in the Special Conditions or a minimum of 1 set of complete documents.

2.04. CONTRACTOR'S PRE-AWARD REPRESENTATIONS. The Contractor represents that Contractor has familiarized themselves with, and assumes full responsibility for having familiarized themselves

with, the nature and extent of the Contract Documents, Work, locality, and with all local conditions and federal, state, and local laws, ordinances, rules and regulations that may in any manner affect performance of the Work, and represents that the Contractor has correlated their study, observations and site visits with the requirements of the Contract Documents. The Contractor also represents that the Contractor has studied all surveys and investigation reports of subsurface and latent physical conditions referred to in the Specifications and made such additional surveys and investigations as the Contractor deems necessary for the performance of the Work at the Contract Price in accordance with the requirements of the Contract Documents and that the Contractor has correlated the results of all such data with the requirements of the Contract Documents.

- 2.05. COMMENCEMENT OF CONTRACT TIME; NOTICE TO PROCEED.** Unless otherwise provided in the SPECIAL CONDITIONS, the Contractor will be expected to start active and continuous work on the contract within fifteen (15) calendar days after the date of the Notice to Proceed. In **no case** shall work begin prior to the date of the Notice to Proceed unless this time is waived and mutually agreed upon and indicated on the Notice to Proceed. If a delayed starting date is indicated in the proposal, the fifteen (15) calendar day limitation shall be waived. Work day charges will then begin on a date mutually agreed upon, but not later than the delayed starting date specified. In the event that any contract is canceled after an award has been made but prior to the issuing of the Notice to Proceed, no reimbursement will be made for any expenses accrued relative to this contract during that period.
- 2.06. STARTING THE PROJECT.** The Engineer shall be notified at least three (3) days in advance of the date on which the work is expected to begin. Should the prosecution of the work for any reason be discontinued, the Engineer shall be notified at least twenty-four (24) hours in advance of resuming operations.
- 2.07. BEFORE STARTING CONSTRUCTION.** Before undertaking each part of the Work, the Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. The Contractor shall at once report in writing to the Engineer any conflict, error, or discrepancy which the Contractor may discover. However, Contractor shall not be liable to the Owner or Engineer for the Contractor's failure to discover any conflict, error, or discrepancy in the Drawings or Specifications.
- 2.08. SUBMISSION OF SCHEDULES.** Within ten (10) days after delivery of the executed Agreement by the Owner to the Contractor, the Contractor shall submit to the Engineer for review, an estimated progress schedule that shall be in 'Critical Path' format and indicating the starting and completion dates of the various stages of the Work, and a preliminary schedule of Shop Drawing submissions and other specified schedules. The 'Critical Path' schedule must include all possible overlapping work that can be accomplished should one action or function not be available or accessible to the contractor in order to show that the Contractor's interrelated activities that will control the work path to complete the project within the time limits set forth for the project. Contracts with fewer than sixty (60) calendar days completion time, fewer than thirty-five (35) work days, or fewer than sixty (60) days between the date of the notice to proceed and the completion date do not need to submit a progress schedule. The progress schedule may be used as a basis for establishing major construction operations and as a check on the progress of the work. The Engineer shall be notified at least three (3) days in advance of the date on which the work is expected to begin. Sufficient materials, equipment, labor shall be provided by the Contractor to meet the progress schedule (if

required) and to guarantee the completion of the project in accordance with the plans and specifications.

3.00. CORRELATION, INTERPRETATION, AND INTENT OF CONTRACT DOCUMENTS. It is the intent of the Specifications and Drawings to describe a complete Project to be constructed in accordance with the Contract Documents. The Contract Documents comprise the entire Agreement between the Owner and the Contractor. They may be altered only by a Modification.

The Contract Documents are complementary. What is called for by one is as binding as if called for by all. If the Contractor finds a conflict, error, or discrepancy in the Contract Documents, the Contractor shall call it to the Engineer's attention in writing at once. Before proceeding with the Work affected thereby, the Contractor shall not be liable to the Owner or Engineer for their failure to discover any conflict, error or discrepancy in the Specifications or Drawings. Any Work that may reasonably be inferred from the Specifications or Drawings as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to refer to such recognized standards.

In case of discrepancy, and subject to the terms of the **AGREEMENT** between Owner and Contractor, calculated dimensions will govern over scaled dimensions; plans will govern over specifications; special conditions will govern over the plans and specifications. The instructions to Bidders and the description of the pay items listed in the itemized proposal will govern over plans, specifications, and special conditions. The precedence outlined herein shall not absolve the Contractor of their responsibility with regard to errors and omissions, or from the Contractor's requirement to follow all IOSHA, OSHA, any local safety ordinances, and general good construction practices.

Advantage shall not be taken of any apparent error or omission in the plans or specifications. In the event such an error or omission is discovered, the Engineer shall be notified immediately in writing. Such corrections and interpretations as may be deemed necessary for fulfilling the intent of the plans and specifications will then be made.

4.00. AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS.

4.01. AVAILABILITY OF LANDS. The Owner shall furnish, as indicated in the Contract Documents and not later than the date of the Notice to Proceed, the lands upon which the Work is to be done, rights-of-way for access thereto, and such other lands which are designated for use by the Contractor. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by Owner, unless otherwise specified in the Contract Documents. If the Contractor believes that any delay in the Owner's furnishing these lands or easements entitles the Contractor to an extension of the Contract Time, the Contractor may make a claim therefore as provided in these General Conditions.

4.02. PHYSICAL CONDITIONS; SURVEYS AND REPORTS. Refer to **Instructions to Bidder**. For identification of those surveys and investigation reports of subsurface and latent physical conditions at the Project site or otherwise affecting performance of the Work which have been relied upon by the Engineer in preparation of the Drawings and Specifications, refer to **SPECIAL CONDITIONS**.

4.03. UNFORESEEN PHYSICAL CONDITIONS. The Contractor shall promptly notify the Owner and Engineer in writing of any subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents. The Engineer will promptly investigate those conditions and advise the Owner in writing if further surveys or subsurface tests are necessary. Promptly thereafter, the Owner shall obtain the necessary additional surveys and tests and furnish copies to the Engineer and Contractor. If the Engineer finds that the results of such surveys or tests indicate

that there are subsurface or latent physical conditions which differ materially from those intended in the Contract Documents, and which could not reasonably have been anticipated by the Contractor, a Change Order shall be issued incorporating the necessary revisions.

4.04. REFERENCE POINTS. The Owner shall provide engineering surveys for construction to establish reference points which in the Owner's judgment are necessary to enable the Contractor to proceed with the Work. The Contractor shall be responsible for surveying and laying out the Work (unless otherwise provided in the Special Conditions), and shall protect and preserve the established reference points and shall make no changes or reallocations without the prior written approval of the Owner. The Contractor shall report to the Engineer whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations. The Contractor shall replace and accurately relocate all reference points so lost, destroyed or moved at the Contractor's expense.

5.00. BONDS AND INSURANCE.

5.01. PERFORMANCE, PAYMENT AND OTHER BONDS. When Contractor delivers the executed counterparts of the **AGREEMENT** to Owner, the Contractor shall furnish a Performance Bond, Payment Bond, and other Bonds specified in **AGREEMENT** as security for the faithful performance and payment of all the Contractor's obligations under the Contract Documents. The Performance Bond shall be in an amount at least equal to 100% of the Contract Price, unless otherwise listed in **SUPPLEMENTARY CONDITIONS**. The Payment Bond shall also be in an amount at least equal to 100% of the Contract Price, unless otherwise listed in **SUPPLEMENTARY CONDITIONS**. Bonds shall be executed on the forms (when provided) included in the Contract Documents and with such sureties as are licensed to conduct business in the state of Indiana and are named in the current list of "Surety Companies Acceptable on Federal Bonds" as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. The surety shall have an "A" minimum rating of performance and a financial rating strength of five times the Contract Price, all as stated in "Best's Key Rating Guide, Property-Liability". Each Bond shall be accompanied by a "Power of Attorney" authorizing the attorney-in-fact to bind the surety and certified to include the date of the Bond.

5.02. TERMINATION OF SURETY. If the surety on any Bond furnished by the Contractor is declared a bankrupt or becomes insolvent or its right to do business is terminated or revoked in any state where any part of the Project is located, the Contractor shall within five (5) days thereafter substitute another Bond and surety, both of which shall be acceptable to the Owner.

5.03. CONTRACTOR'S LIABILITY INSURANCE. The Contractor shall purchase and maintain such insurance as will protect the Contractor from claims under worker's compensation laws, disability benefit laws, or similar employee benefit laws, from claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees, and claims insured by personal injury liability coverage; from claims for damages because of bodily injury, sickness or disease, or death of any person other than his or her employees including claims insured by personal injury liability coverage; and from claims for injury to or destruction of tangible property, including loss of use resulting therefrom - any or all of which may arise out of or result from the Contractor's operations under the Contract Documents, whether such operations be by Contractor or by any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be legally liable. This insurance shall include the specific coverage's and be written for not less than any limits of liability and maximum deductibles specified in the

Supplementary Conditions or required by law, whichever is greater, shall include contractual liability insurance and shall include the Owner and Engineer as additional insured parties. Before starting the Work, the Contractor shall file with the Owner and Engineer certificates of such insurance, acceptable to the Owner; these certificates shall contain a provision that the coverage afforded under the policies will not be canceled or materially changed until at least fifteen (15) days prior written notice has been given to the Owner and Engineer.

6.00. CONTRACTOR'S RESPONSIBILITIES.

6.01. SUPERVISION AND SUPERINTENDENCE. The Contractor shall supervise and direct the Work efficiently and with the Contractor's best skill and attention. The Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but the Contractor shall not be solely responsible for the negligence of others in the design or selection of a specific means, method, technique, sequence or procedure of construction which is indicated in and required by the Contract Documents. The Contractor shall be responsible to see that the finished Work complies accurately with the Contract Documents.

6.02. RESIDENT SUPERINTENDENT. The Contractor shall keep on the Work site at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to the Owner and Engineer. The superintendent will be the Contractor's representative at the site and shall have authority to act on behalf of the Contractor. All communications given to the superintendent shall be as binding as if given to the Contractor.

6.03. LABOR, MATERIALS AND EQUIPMENT. The Contractor shall furnish all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water and sanitary facilities, and all other facilities and incidentals necessary for the execution, testing, initial operation, and completion of the Work.

All materials and equipment shall be new, except as otherwise provided in the Contract Documents. If required by the Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator or processors, except as otherwise provided in the contract Documents.

The Contractor shall be fully responsible for all acts and omissions of the Contractor's Subcontractors and of persons and organizations directly or indirectly employed by them, and of persons and organizations for whose acts any of them may be liable to the same extent that the Contractor is responsible for the acts and omissions of persons directly employed by the Contractor. Nothing in the Contract Documents shall create any contractual relationship between the Owner or Engineer and any Subcontractor or other person or organization having a direct contact with the Contractor, nor shall it create any obligation on the part of the Owner or Engineer to pay or to see to the payment of any monies due any Subcontractor or any other person or organization, except as may otherwise be required by law. The Owner or Engineer may furnish to any Subcontractor or other person or organization, to the extent practicable, evidence of amounts paid to the Contractor on account of specific Work done in accordance with the schedule of values.

The divisions and sections of the Specifications and the identification of any Drawings shall not control the Contractor in dividing the Work among Subcontractors or delineating the Work to be performed by any specific trade.

The Contractor agrees to bind specifically every Subcontractor to the specific terms and conditions of the Contract Documents for the benefit of the Owner.

All Work performed for the Contractor by a Subcontractor shall be pursuant to an appropriate agreement between the Contractor and the Subcontractor which shall contain provisions that waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by insurance, except such rights as they may have to the proceeds of such insurance. The Contractor shall pay each Subcontractor a just share of any insurance monies received by the Contractor.

- 6.04. PATENT FEES AND ROYALTIES.** The Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of the Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by the Owner in the Contract Documents. The Contractor shall indemnify and hold harmless the Owner and Engineer and anyone directly or indirectly employed by either of them from and against all claims, damages, losses and expenses (including attorneys' fees) arising out of any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.
- 6.05. PERMITS.** The Contractor shall obtain and pay for all construction permits and licenses and shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of his/her Bid. The Owner shall assist the Contractor, when necessary, in obtaining such permits and licenses. The Contractor shall also pay all public utility charges necessary for the meter/service connections to place installed devices into working order and placing said service accounts in the name of the City of Bloomington, or their assigned designee.
- 6.06. LAWS AND REGULATIONS.** The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations applicable to the Work. If the Contractor observes that the Specifications or Drawings are in conflict therewith, the Contractor shall give the Engineer prompt written notice thereof, and any necessary changes shall be adjusted by an appropriate Modification. If the Contractor performs any Work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Engineer, the Contractor shall bear all costs arising there from; however, it shall not be the Contractors primary responsibility to make certain that the Specifications and Drawings are in accordance with such laws, ordinances, rules and regulations.
- 6.07. TAXES.** The Contractor shall pay all sales, consumer, use and other similar taxes required to be paid by the Contractor in accordance with the law of the place where the work is to be performed. The Owner is exempt from sales tax on products permanently incorporated into the work. The Contractor may obtain sales tax exemption for such materials, products, and equipment and may obtain an Indiana General Sales Tax Exemption Certificate from the Owner.

6.08. Use of PREMISES. The Contractor shall confine their equipment, the storage of materials and equipment and the operations of the Contractor's workmen to areas permitted by law, ordinances, permits, or the requirements of the Contract Documents, and shall not unreasonably encumber the premises with materials or equipment. No assumptions of allowable traffic closures shall be made by the Contractor unless specifically called for in a "Maintenance of Traffic" plan should one exist. All roadway and lane closures must be approved by the Engineer prior to implementing the closure and a 'Notice of Intent' to close a lane or roadway must be delivered in writing to the Engineer by the Wednesday preceding the week of the desired closure date or time so proper notification can be given to the required personnel.

The Contractor shall not load nor permit any part of any structure to be loaded with weights that will endanger the structure, nor shall the Contractor subject any part of the Work to stresses or pressures that will endanger it.

6.09. RECORD DRAWINGS. The Contractor shall keep one record copy of all Specifications, Drawings, Addenda, Modifications, and Shop Drawings at the site in good order and annotated to show all changes made during the construction process. These shall be available to the Engineer and shall be delivered to the Engineer for the Owner upon completion of the Project and prior to final payment.

6.10. SAFETY AND PROTECTION. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to: all employees on the Work and other persons who may be affected thereby. This includes ensuring the safety of pedestrians, bicyclist, and motorists who are allowed to access the site during the project. All the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation, or replacement in the course of construction.

The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. The Contractor shall notify owners of adjacent utilities when prosecution of the Work may affect them. All damage, injury or loss to any property caused directly or indirectly, in whole or in part, by the Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by the Contractor: except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of the Owner or Engineer or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the Contractor. The Contractor's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and the Engineer has issued a notice to the Owner and Contractor in accordance with Supplementary Conditions that the Work is acceptable.

6.11. SUPERINTENDENT OF SAFETY. The Contractor shall designate a responsible member of his or her organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by the Contractor to the Owner. The Superintendent of Safety shall be responsible for the maintenance of traffic control devices and personnel in accordance with the Manual on Uniform Traffic Control Devices (M.U.T.C.D.) for

work zone safety. Weekly "Sign and Barricade Reports" are to be submitted by the Superintendent of Safety.

6.12. EMERGENCIES. In emergencies affecting the safety of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Engineer or Owner, is obligated to act, at the Contractor's discretion, to prevent threatened damage, injury or loss. The Contractor shall give the Engineer prompt written notice of any significant changes in the Work or deviations from the Contract Documents caused thereby, and a Change Order shall thereupon be issued covering the changes and deviations involved. If the Contractor believes that additional work done by the Contractor in an emergency which arose from causes beyond the Contractor's control entitles the Contractor to an increase in the Contract Price or an extension of the Contract Time, the Contractor may make a claim therefore.

6.13. INDEMNIFICATION. The Contractor shall indemnify and hold harmless the Owner and Engineer and their agents and employees from and against all claims, damages, losses and expenses including attorneys' fees arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense: is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting there from and is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable regardless of whether or not it is caused in part by a party indemnified hereunder. In any and all claims against the Owner or Engineer or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts. The indemnification obligations of the Contractor shall not extend to the liability of the Engineer, the Engineer's agents or employees arising out of: the preparation of maps, drawings, opinions, reports, surveys, Change Orders, designs, or specifications or the giving of or the failure to give directions or instructions by the Engineer, his or her agents or employees, provided such giving or failure to give is the primary cause of injury or damage.

7.00. WORK BY OTHERS.

The Owner may perform additional work related to the Project by its own forces, or the Owner may let other direct contracts therefore which shall contain General Conditions similar to these. The Contractor shall afford the other contractors who are parties to such direct contracts (or the Owner, if Owner is performing the additional work) reasonable opportunity for the introduction and storage of materials and equipment and the execution of work, and shall properly connect and coordinate the Contractor's Work with theirs.

If any part of the Contractor's Work depends for proper execution or results upon the work of any such other contractor (or Owner), the Contractor shall inspect and promptly report to the Engineer in writing any defects or deficiencies in such work that render it unsuitable for such proper execution and results. The Contractor's failure to so report shall constitute an acceptance of the other work as fit and proper for the relationship of the Contractor's Work except as to defects and deficiencies which may appear in the other work after the execution of the Contractor's Work.

The Contractor shall do all cutting, fitting, and patching of the Contractor's Work that may be required to make its several parts come together properly and fit it to receive or be received by such other work. The Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of the Engineer and of the other contractors whose work will be affected.

If the performance of additional work by other contractors or the Owner is not noted in the Contract Documents prior to the execution of the contract, written notice thereof shall be given to the Contractor prior to starting any additional work. If the Contractor believes that the performance of any such additional work by the Owner or others involves the Contractor in additional expense or entitles the Contractor to an extension of the Contract Time, the Contractor may make a claim therefore.

8.00. OWNER'S RESPONSIBILITIES.

The Owner shall issue all communications to the Contractor through the Engineer.

In case of termination of the employment of the Engineer, the Owner shall appoint an engineer against whom the Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer. Any dispute in connection with such an appointment shall be subject to arbitration.

The Owner shall furnish the data required of the Owner under the Contract Documents promptly and shall make payments to the Contractor promptly after they are due.

In addition to the Owner's rights to request changes in the Work, the Owner shall be obligated to execute Change Orders.

9.00. ENGINEER'S STATUS DURING CONSTRUCTION.

9.01. OWNER'S REPRESENTATIVE. The Engineer will be the Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of the Engineer as the Owner's representative during construction are set forth in these General Conditions and shall not be extended without the written consent of the Owner and the Engineer.

9.02. CLARIFICATIONS AND INTERPRETATIONS. The Engineer will issue with reasonable promptness such written clarifications or interpretations of the Contract Documents (in the form of Drawings or otherwise) as the Engineer may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. If the Contractor believes that a written clarification and interpretation entitles the Contractor to an increase in the Contract Price, the Contractor may make a claim therefore.

9.03. REJECTING DEFECTIVE WORK. The Engineer will have authority to reject Work which is "defective" (which term is hereinafter used to describe Work that is unsatisfactory, faulty or defective, or does not conform to the requirements of the Contract Documents or does not meet the requirements of any inspection, test or approval referred to in the Specifications, or has been damaged prior to the Engineer's recommendation of final payment). The Engineer will also have authority to require special inspection or special testing of the Work whether or not the Work is fabricated, installed or completed.

9.04. DECISIONS ON DISAGREEMENTS. The Engineer will be the interpreter of the requirements of the Contract Documents and the judge of the performance hereunder. In the Engineer's capacity as interpreter and judge he/she will exercise his/her best efforts to insure faithful performance by

both Owner and Contractor. He or she will not show partiality to either and will not be liable for the result of any interpretation or decision rendered in good faith. Claims, disputes, and other matters relating to the execution and progress of the Work or the interpretation of or performance under the Contract Documents shall be referred to the Engineer for decision, which the Engineer will render in writing within a reasonable time.

9.05. ARBITRATION. Either the Owner or the Contractor may demand arbitration with respect to any such claim, dispute, or other matter that has been referred to the Engineer, except any which have been waived by the making or acceptance of final payment, such arbitration to be in accordance with these General Conditions. However, no demand for arbitration of any such claim, dispute, or other matter shall be made until the earlier of (a) the date on which the Engineer has rendered his/her decision or (b) the tenth day after the parties have presented their evidence to the Engineer if he/she has not rendered his/her written decision before that date. No demand for arbitration shall be made later than thirty (30) days after the date on which the Engineer rendered his/her written decision in respect to the claim, dispute or other matter as to which arbitration is sought; and the failure to demand arbitration within said thirty (30) day period shall result in the Engineer's decision being final and binding upon the Owner and the Contractor. If the Engineer renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but shall not supersede the arbitration proceedings, except where the decision is acceptable to the parties concerned.

9.06. LIMITATIONS ON THE ENGINEER'S RESPONSIBILITIES. Neither the Engineer's authority to act under this article or elsewhere in the Contract Documents nor any decision made by the Engineer in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of the Engineer to the Contractor, any Subcontractor, any material, manufacturer, fabricator, supplier or any of their agents or employees or any other person performing any of the Work.

The Engineer will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, and the Engineer will not be responsible for the Contractor's failure to perform the Work in accordance with the Contract Documents.

The Engineer will not be responsible for the acts or omissions of the Contractor, or any Subcontractors, or any of Contractor's or their agents or employees or any other persons at the site or otherwise performing any of the Work.

10.00. CHANGES IN THE WORK.

Without invalidating the Agreement, the Owner may, at any time or from time to time, order additions, deletions or revisions in the Work; these will be authorized by Change Orders and initiated through a Field Order or Work Change Directive from the Engineer or Owner. Upon receipt of a Change Order, the Contractor shall proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents. If any Change Order causes an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made as provided in these General Conditions on the basis of a claim made by either party.

The Engineer may authorize minor changes or alterations in the Work not involving extra cost and not inconsistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order or Work Change Directives. If the Contractor believes that any minor change or alteration authorized

by the Engineer entitles Contractor to an increase in the Contract Price, the Contractor may make a claim therefore.

Additional work performed by the Contractor without authorization of a Change Order will not entitle him or her to an increase in the Contract Price or an extension of the Contract Time, except as otherwise provided herein.

The Owner shall execute appropriate Change Orders prepared by the Engineer covering changes in the Work to be performed as provided herein and any other claim of the Contractor for a change in the Contract Time or the Contract Price which is confirmed by the Engineer.

It is the Contractor's responsibility to notify his or her Surety of any changes affecting the general scope of the Work or change in the Contract Price and the amount of the applicable Bonds shall be adjusted accordingly.

11.00. CHANGE OF CONTRACT PRICE.

The Contract Price constitutes the total compensation payable to the Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by the Contractor shall be at the Contractor's expense without change in the Contract Price.

The Contract Price may only be changed by a Change Order. Any claim for an increase in the Contract Price shall be based on written notice delivered to the Owner and Engineer within twenty (20) days of the occurrence of the event giving rise to the claim. Notice of the amount of the claim with supporting data shall be delivered within forty-five (45) days of such occurrence unless the Engineer allows an additional period of time to ascertain accurate cost data. All claims for adjustments in the Contract Price shall be determined by the Engineer if the Owner and the Contractor cannot otherwise agree on the amount involved. Any change in the Contract Price resulting from any such claim shall be incorporated in a Change Order. All changes requested by the Engineer or Owner must be submitted to the Contractor in the form of a Field Order, at which time, the contractor shall provide in return a request for a change order with the prices for said requested work detailed by item and quantity for the Engineer and Owner to review for acceptance and so they can issue a Change Order for the approved work.

The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:

Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved.

By mutual acceptance of a lump sum.

On the basis of the Cost of the Work plus a Contractor's Fee for overhead and profit (determined in accordance with the following paragraphs).

11.01. COST OF THE WORK. The term "Cost of the Work" means the sum of all costs necessarily incurred and paid by the Contractor in the proper performance of the Work. Except as otherwise may be agreed to in writing by the Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, and shall include only the following items:

Payroll costs for employees in the direct employ of the Contractor in the performance of the Work under schedules of job classifications set forth in the Wage Scale Determination. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of

fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, worker's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Such employees shall include superintendents and foremen at the site. The expenses of performing Work after regular working hours, on Sunday or legal holidays shall be included in the above to the extent authorized by the Owner.

The cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and manufacturers' field services required in connection therewith. All cash discounts shall accrue to the Contractor unless the Owner deposits funds with the Contractor with which to make payments, in which case the cash discounts shall accrue to the Owner. All trade discounts, rebates and refunds, and all returns from sale of surplus materials and equipment shall accrue to the Owner, and the Contractor shall make provisions so that they may be obtained.

Payments made by the Contractor to the Subcontractors for Work performed by the Subcontractors. If required by the Owner, the Contractor shall obtain competitive bids from Subcontractors acceptable to the Owner and shall deliver such bids to the Owner, who will then determine with the advice of the Engineer which bids will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a Fee, the Subcontractor's Cost of the Work shall be determined in the same manner as the Contractor's Cost of the Work. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

Costs of special consultants (including, but not limited to, engineers, architects, testing laboratories, surveyors, lawyers and accountants) employed for services specifically related to the Work.

11.02. SUPPLEMENTAL COSTS include the following:

The proportion of necessary transportation, traveling and subsistence expenses of the Contractor's employees incurred in discharge of duties connected with the Work.

The cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workmen, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of the Contractor.

Rentals of all construction equipment and machinery and the parts thereof whether rented from the Contractor or others in accordance with the rental agreements approved by the Owner with the advice of the Engineer, and the costs of transportation, loading, unloading, installation, dismantling and removal thereof - all in accordance with the terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

Sales, use or similar taxes related to the Work, and for which the Contractor is liable, imposed by any governmental authority.

Deposits lost for causes other than the Contractor's negligence, royalty payments and fees for permits and licenses.

Losses, damages and expenses, not compensated by insurance or otherwise, sustained by the Contractor in connection with the execution of, and to, the Work, provided they have resulted from causes other than the negligence of the Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of the Owner. No such losses,

damages and expenses shall be included in the Cost of the Work for the purpose of determining the Contractor's fee. If, however, any such loss or damage requires reconstruction and the Contractor is placed in charge thereof, the Contractor shall be paid for the Contractor's services a fee proportionate to that stated under Contractor's Fee.

The cost of utilities, fuel and sanitary facilities at the site.

Minor expenses such as telegrams, long distance phone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

The cost of premiums for additional bonds and insurance required because of changes in the Work.

11.03 The term "**COST OF THE WORK**" shall *not* include any of the following:

Payroll costs and other compensation of the Contractor's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, lawyers, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by the Contractor, whether at the site or in the Contractor's principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications - all of which are to be considered administrative costs covered by the Contractor's Fee.

Expenses of the Contractor's principal and branch offices other than the Contractor's office at the site.

Any part of the Contractor's capital expenses, including interest on the Contractor's capital employed for the Work and charges against the Contractor for delinquent payments.

Cost of premiums for all bonds and for all insurance policies whether or not the Contractor is required by the Contract Documents to purchase and maintain the same (except as otherwise provided above).

Costs due to the negligence of the Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to the correction of defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

Other overhead or general expense costs of any kind not specifically and expressly included in the Cost of the Work.

11.04. CONTRACTOR'S FEE. The Contractor's Fee which includes the Contractor's overhead and profit shall be determined as follows:

A mutually acceptable fee; or, if none can be agreed upon,

A fee based on the following percentages of the various portions of the Cost of the Work:

for payroll costs and the cost of all materials and equipment included in the Work, the Contractor's Profit shall be ten percent.

for payments to Subcontractors, the Contractor's Profit shall be five percent; and if a subcontract is on the basis of Cost of the Work Plus a Fee, the maximum allowable to the Subcontractor as a fee for overhead and profit shall be ten percent, and

no fee shall be payable on the basis of costs of special consultants or supplemental costs.

11.05. CREDIT. The amount of credit to be allowed by the Contractor to the Owner for any such change which results in a net decrease in cost, will be the amount of the actual net decrease. When both additions and credits are involved in any one change, the combined overhead and profit shall be figured on the basis of the net increase, if any.

Whenever the cost of any Work is to be determined pursuant to preceding paragraphs, the Contractor will submit in form prescribed by the Engineer an itemized cost breakdown together with supporting data.

11.06. UNIT PRICE WORK. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the approximate quantity of each item as indicated in the Agreement.

The approximated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order.

12.00. CHANGE OF CONTRACT TIME.

The Contract Time may only be changed by a Change Order. Any claim for an extension in the Contract Time shall be based on written notice delivered to the Owner and Engineer within twenty (20) days of the occurrence of the event giving rise to the claim. Notice of the extent of the claim with supporting data shall be delivered within forty-five (45) days of such occurrence unless the Engineer allows an additional period of time to ascertain more accurate data. All claims for adjustment in the Contract Time shall be determined by the Engineer if the Owner and the Contractor cannot otherwise agree. Any change in the Contract Time resulting from any such claim shall be incorporated in a Change Order. Computation of Contract time shall be in accordance with the contract agreement and not that of the Indiana Department of Transportation (INDOT).

The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of the Contractor if the Contractor makes a claim therefore as provided in the preceding paragraph. A claim for an extension of the Contract Time otherwise allowable under the Contract Documents, shall be granted only to the extent the time lost exceeds the float, using Critical Path analysis as called for in Section 2.08 above, for a delayed activity at the time of the event giving rise to the Claim. Float, whether expressly disclosed or implied in any manner, is jointly owned by the project participants. Such delays shall include, but not be restricted to, acts or neglect by any separate contractor employed by the Owner, fires, floods, labor disputes, epidemics, abnormal weather conditions, or acts of God.

All time limits stated in the Contract Documents are of the essence of the Agreement. The Contractor agrees to make no monetary claim for delays, interferences or hindrances of any kind in the performance of this Contract occasioned by any act or omission to act of the Owner or any other party, and agrees that

any such claim shall be fully compensated for by an extension of time to complete performance of the work where Critical Path analysis shows such an extension of time is warranted.

13.00. LIQUIDATED DAMAGES.

Liquidated damages shall be paid to the Owner in accordance with the Agreement. If no provision is made in the Agreement, liquidated damages shall be paid as follows:

In the event the Contractor fails to satisfactorily complete the entire Work contemplated and provided for under this contract on or before the date of completion as determined and described elsewhere herein, the Owner shall deduct from the amount due the Contractor the sum of Five Hundred Dollars (\$500.00) for each calendar day of delay, which sum is agreed upon not as a penalty, but as a fixed and liquidated damage for each day of such delay, to be paid in full and subject to no deduction, it being understood and agreed that timely completion is of the essence. If the monies due the Contractor are less than the amount of such liquidated damages, then the Contractor or the Contractor's surety shall pay the balance to the Owner.

14.00. WARRANTY AND GUARANTEE: TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK.

14.01. WARRANTY AND GUARANTEE. The Contractor warrants and guarantees to the Owner and Engineer that all materials and equipment will be new unless otherwise specified and that all Work will be of good quality and free from faults or defects and in accordance with the requirements of the Contract Documents and of any inspections, tests or approvals referred to in the Tests and Inspection paragraph. All unsatisfactory Work, all faulty or defective Work, and all Work not conforming to the requirements of the Contract Documents at the time of acceptance thereof or of such inspections, tests or approvals, shall be considered defective. Prompt notice of all defects shall be given to the Contractor. All defective Work, whether or not in place, may be rejected, corrected, or accepted as provided herein.

14.02. TESTS AND INSPECTIONS. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to specifically be inspected, tested, or approved by some public body, the Contractor shall assume full responsibility therefore, pay all costs in connection therewith and furnish the Engineer the required certificates of inspection, testing, or approval. All other inspections, tests, or approvals required by the Contract Documents shall be performed by organizations acceptable to the Owner and the Contractor and the costs thereof shall be borne by the Owner unless otherwise specified.

The Contractor shall give the Engineer timely notice of readiness of the Work for all inspections, tests or approvals. If any such Work required so to be inspected, tested or approved is covered without written concurrence of the Engineer, it must, if requested by the Engineer, be uncovered for observation, and such uncovering shall be at the Contractor's expense unless the Contractor has given the Engineer timely notice of the Contractor's intention to cover such Work and the Engineer has not acted with reasonable promptness in response to such notice. This timeframe of notification shall be no less than 2 hours, and occur during normal working hours of the City of Bloomington (Monday through Friday – 8:00a.m. to 5:00p.m.) Requests for inspection during all other hours shall receive 48 hours' notice.

Neither observations by the Engineer nor inspections, tests or approvals by persons other than the Contractor shall relieve the Contractor from his/her obligations to perform the Work in accordance with the Contract Documents.

14.03. ACCESS TO WORK. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.04. UNCOVERING WORK. If any Work is covered contrary to the written request of the Engineer, it must, if requested by the Engineer, be uncovered by the Contractor for the Engineer's observation and replaced at the Contractor's expense.

If any Work has been covered which the Engineer has not specifically requested to observe prior to its being covered, or if the Engineer considers it necessary or advisable that covered Work be inspected or tested by others, the Contractor, at the Engineer's request, shall uncover, expose or otherwise make available for observation, inspection or testing as the Engineer may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, the Contractor shall bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, including compensation for additional professional services, and an appropriate deductive Change Order shall be issued. If, however, such Work is not found to be defective, the Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction if the Contractor makes a claim therefore.

14.05. OWNER MAY STOP THE WORK. If the Work is defective, or the Contractor fails to supply sufficient skilled workmen or suitable materials or equipment, or if the Contractor fails to make prompt payment to Subcontractors or for labor, materials or equipment, the Owner may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other party.

14.06. CORRECTION OR REMOVAL OF DEFECTIVE WORK. If required by the Engineer prior to his/her recommendation of final payment, the Contractor shall promptly, without cost to the Owner and as specified by the Engineer, either correct any defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by the Engineer, remove it from the site and replace it with non-defective Work. If the Contractor does not correct such defective Work within a reasonable time, all as specified in a written notice from the Engineer, the Owner may have the deficiency corrected or the rejected Work removed and replaced. All direct or indirect costs of such correction or removal and replacement, including compensation for additional professional services, shall be paid by the Contractor, and an appropriate deductive Change Order shall be issued. The Contractor shall also bear the expenses of making good all Work of others destroyed or damaged by the Contractor's correction, removal or replacement of his/her defective Work.

14.07. CORRECTION PERIOD. If, after final payment and prior to the expiration of one year after the date of Substantial Completion (unless a longer period is set forth in the Supplementary Conditions) or such longer period as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, any Work is found to be defective, the Contractor shall promptly, without cost to the Owner and in accordance with the Owner's written instructions, either correct such defective Work or, if it has been rejected by the Owner, remove it from the site and

replace it with non-defective Work. If the Contractor does not promptly comply with the terms of such instructions, the Owner may have the defective Work removed and replaced, and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, shall be paid by the Contractor.

14.08. ACCEPTANCE OF DEFECTIVE WORK. If, instead of requiring correction or removal and replacement of defective Work, the Owner (and, prior to final payment, the Engineer) prefers to accept it, the Engineer or Owner may do so. In such case, if acceptance occurs prior to final payment, a Change Order shall be issued incorporating the necessary revisions in the Contract Documents, including appropriate reduction in the Contract Price; or, if the acceptance occurs after final payment, an appropriate amount shall be paid by the Contractor to the Owner.

14.09. NEGLECTED WORK BY THE CONTRACTOR. If the Contractor should fail to prosecute the Work in accordance with the Contract Documents, including any requirements of the progress schedule, the Owner, after seven (7) days written notice to the Contractor may, without prejudice to any other remedy the Owner may have, make good such deficiencies and the cost thereof (including compensation for additional professional services) shall be charged against the Contractor if the Engineer agrees with such action, in which case a Change Order shall be issued incorporating the necessary revisions in the Contract Documents including an appropriate reduction in the Contract Price. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

15.00. PAYMENTS AND COMPLETION.

15.01. APPLICATION FOR PROGRESS PAYMENT. The Contractor may, no more frequently than every thirty (30) days make an estimate of the value of the Work completed, and submit an Application for Payment. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 11.06. The estimated cost of repairing, replacing, or rebuilding any part of the Work or replacing materials which do not conform to the Contract Documents will be deducted from the estimated value. The Application for Payment shall be submitted to the Engineer for review and approval.

15.01.01. At least twenty (20) days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

15.01.02. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation *establishing full payment by Contractor for the materials and equipment*; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

15.01.03. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor

have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

15.01.03. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

15.02. CONTRACTOR'S WARRANTY OF TITLE. The Contractor warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to the Owner at the time of payment free and clear of all liens, claims, security interests and encumbrances (hereafter in these General Conditions referred to as "Liens").

15.03. REVIEW OF APPLICATION FOR PAYMENT. The Contractor shall furnish to the Engineer such detailed information as the Engineer may request to aid in the review and approval of such Estimates. The Engineer will, within five (5) working days after receipt of each Application for Payment, either recommend payment and present the Application to the Owner, or return the Application to the Contractor indicating in writing the Engineer's reasons for refusing to recommend payment. In the latter case, the Contractor may make the necessary corrections and resubmit the Application. The Owner will pay to the Contractor within forty-five (45) days after receipt of Application. The escrow agent, Owner, and Contractor shall enter into a written escrow agreement. Under that agreement, the Owner shall withhold five percent (5%) of the dollar value of all work satisfactorily completed until the Contract work is complete. Upon substantial completion of the work, any amount retained may be paid to the Contractor. When the work has been substantially completed except for the work which cannot be completed due to weather conditions, lack of materials or other reasons which in the judgment of the Owner are valid reasons for non-completion, the Owner may make additional payments, retaining at all times an amount sufficient to cover the estimated cost of the work still to be completed. Such Applications for Payment are processed on a regular biweekly schedule, which will be provided to the Contractor.

15.04. FINAL INSPECTION. When the Work has been substantially completed and at a time mutually agreeable to the Owner, Engineer, and Contractor, the Engineer and Contractor shall make a final walk-through inspection of the Work. The Engineer shall report to the Owner his/her findings as to the acceptability and completeness of the Work.

15.05. APPLICATION FOR FINAL PAYMENT. Upon written notice from the Engineer that Work is completed and acceptable as provided in the Supplementary Conditions, the Contractor shall make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all other documentation called for in the Contract Documents and such other data and schedules as the Engineer may reasonably require.

15.06. FINAL PAYMENT. If, on the basis of the Engineers observation and review of the Work during construction, his/her final inspection and his/her review of the final Application for Payment, all as required by the Contract Documents, the Engineer is satisfied that the Work has been completed and the Contractor has fulfilled all of his/her obligations under the Contract Documents, the Engineer will, within ten (10) days after receipt of the final Application for Payment, present the Application to the Owner for Payment. Thereupon the Engineer will give written notice to the Contractor that the Work is acceptable subject to the provisions of the paragraph regarding waiver of claims. Otherwise, the Engineer will return the Application to the Contractor, indicating in writing his/her reasons for refusing to recommend final payment, in which case the Contractor shall make

the necessary corrections and resubmit the Application. The Owner shall, within forty-five (45) days of presentation to the Owner of the final Application for Payment, pay the Contractor the entire sum found to be due after deducting all amounts to be retained under any provision of the Contract Documents.

15.07. CONTRACTOR'S CONTINUING OBLIGATION. The Contractor's obligation to perform the Work and complete the Project in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by the Engineer, nor the issuance of a certificate of Substantial Completion, nor any payment by the Owner to the Contractor under the Contract Documents, nor any use or occupancy of the Project or any part thereof by the Owner, nor any act of acceptance by the Owner nor any failure to do so, nor any correction of defective Work by the Owner shall constitute an acceptance of Work not in accordance with the Contract Documents.

15.08. WAIVER OF CLAIMS. The making and acceptance of final payment shall constitute:

a waiver of all claims by the Owner against the Contractor other than those arising from unsettled Liens, from defective Work appearing after final inspection or from failure to comply with the requirements of the Contract Documents or the terms of any special guarantees specified therein, and a waiver of all claims by the Contractor against the Owner other than those previously made in writing and still unsettled.

16.00. SUSPENSION OF WORK AND TERMINATION.

16.01. OWNER MAY SUSPEND WORK. The Owner may, at any time and without cause, suspend the Work or any portion thereof for a period of ninety (90) days by notice in writing to the Contractor, which shall fix the date on which Work shall be resumed. The Contractor shall resume the Work on the date so fixed. The Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if the Contractor makes a claim therefore as provided in these General Conditions.

16.02. OWNER MAY TERMINATE. If the Contractor is adjudged a bankrupt or insolvent, or if the Contractor makes a general assignment for the benefit of his/her creditors, or if a trustee or receiver is appointed for the Contractor or for any of his/her property, or if the Contractor files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or similar laws, or if the Contractor repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, or if the Contractor repeatedly fails to make prompt payments to Subcontractors or for labor, materials or equipment or if the Contractor disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction, or if the Contractor disregards the authority of the Engineer, or if he or she otherwise violates any provision of the Contract Documents, then the Owner may, without prejudice to any other right or remedy and after giving the Contractor and the Contractor's Surety seven (7) days' written notice, terminate the services of the Contractor and take possession of the Project and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor, and finish the Work by whatever method the Owner may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the direct and indirect costs of completing the Project, including compensation for additional professional services, such excesses shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. Such costs incurred by the Owner shall be incorporated in a Change Order.

Where the Contractor's services have been so terminated by the Owner, said termination shall not affect any rights of the Owner against the Contractor then existing or which may thereafter accrue. Any retention or payment of monies by the Owner due the Contractor will not release the Contractor from liability.

Upon seven days written notice to the Contractor, the Owner may, without cause and without prejudice to any other right or remedy, elect to abandon the Project and terminate the Agreement. In such case, the Contractor shall be paid for all Work executed and any expense sustained plus a reasonable profit.

16.03. CONTRACTOR MAY STOP WORK OR TERMINATE. If, through no act or fault of the Contractor, the Work is suspended for a period of more than ninety (90) days by the Owner or under an order of court or other public authority, or the Engineer fails to act on any Application for Payment within thirty (30) days after it is submitted, or the Owner fails to pay the Contractor any sum recommended by the Engineer or awarded by arbitrators within thirty (30) days of its approval and presentation, then the Contractor may, upon seven (7) days' written notice to the Owner and Engineer, terminate the Agreement and recover from the Owner payment for all Work executed and any expense sustained plus a reasonable profit. In addition and in lieu of terminating the Agreement, if the Engineer has failed to act on an Application for Payment or the Owner has failed to make any payment as aforesaid, the Contractor may upon seven (7) days' notice to the Owner and Engineer stop the Work until the Contractor has been paid all amounts then due.

17.00. ARBITRATION.

17.01 As a condition precedent to the commencement of judicial action for resolution of Claims, disputes, and other matters in question arising out of, or relating to, the Agreement, including any disagreement with Engineer's decisions, either Owner or Contractor shall file a written demand for arbitration of the dispute with the other party.

17.02 No demand for arbitration of any Claim, dispute, or other matter that is required to be referred to Engineer initially for decision in accordance with Paragraph 10.00, 11.00 and 12.00 of the General Conditions may be made until the earlier of (a) the date on which Engineer has rendered a written decision or (b) thirty (30) days after the parties have presented their evidence to Engineer if a written decision has not been rendered by Engineer before that date. No demand for arbitration of any such Claim, dispute, or other matter may be made later than thirty (30) days after the date on which Engineer has rendered a written decision in respect thereof; and the failure to demand arbitration within said thirty (30) day period shall result in Engineer's decision being final and binding upon Owner and Contractor. If Engineer renders a decision after arbitration or judicial proceedings have been initiated, such decision may be entered as evidence but will not supersede such proceedings, except where the decision is acceptable to the parties concerned.

17.03 In all other cases, the demand for arbitration shall be made within a reasonable time after the Claim, dispute, or other matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such Claim, dispute, or other matter in question would be barred by the applicable statute of limitations.

17.04 If the party upon whom the demand for arbitration is made rejects arbitration, or fails to give a written response within thirty (30) days after receiving the demand, the other party may commence judicial action on the merits of the dispute. If the party upon whom the demand for arbitration is

made accepts arbitration, the other party may commence arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association then obtaining. The agreement to arbitrate entered into in accordance herewith will be specifically enforceable under the prevailing law of any court having jurisdiction.

17.05 If a Claim, dispute, or other matter in question between Owner and Contractor involves the work of a Subcontractor, either Owner or Contractor may join such Subcontractor as a party to the arbitration between Owner and Contractor. Contractor shall include in all subcontracts a specific provision whereby the Subcontractor consents to being joined in an arbitration between Owner and Contractor involving the Work of such Subcontractor. Nothing in this paragraph nor in the provision of such subcontract consenting to joinder shall create any Claim, right, or cause of action in favor of Subcontractor and against Owner, Engineer, or Engineer's Consultants that does not otherwise exist

17.06 The award rendered by the arbitrators will be final, and judgment may be entered upon it in any court having jurisdiction.

18.00. ENVIRONMENTAL REQUIREMENTS.

The Contractor, when constructing a project involving trenching and/or other related earth excavation, shall comply with the following environmental constraints and be required to install appropriate erosion control devices as determined by the City of Bloomington, which may include, but not be limited to the placement of inlet protection, silt fencing, check dams, temporary seeding and/or mulching. All costs for this work shall be included in the cost of the base Bid with work performed by the contractor to ensure that all erosion is contained on site.

18.01. WETLANDS. The Contractor, when disposing of excess, spoil, or other related earth construction materials on public or private property, shall not fill in or otherwise convert wetlands.

18.02. FLOODPLAINS. The Contractor, when disposing of excess, spoil, or other related earth construction materials on public or private property, shall not fill in or otherwise convert 100 year flood plain areas delineated on the latest FEMA Floodplain Maps.

18.03. HISTORIC PRESERVATION. Any excavation by the Contractor that uncovers an historical or archaeological artifact shall be immediately reported to the City Engineer's Office. Construction shall be temporarily halted pending the notification process and further directions issued by the City after consultation with the State Historic Preservation Office (SHPO).

18.04. ENDANGERED SPECIES. The Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species or their critical habitat be brought to the attention of the contractor, the contractor shall immediately report this evidence to the City Engineer. Construction shall be temporarily halted pending the notification process and further directions issued by the OWNER after consultation with the U.S. Fish and Wildlife Service.

18.05 Rule 5 Permit. The Contractor shall comply with all applicable requirements of the Rule 5 Permit for erosion control utilizing applicable Best Management Practices (B.M.P.'s) prior to the commencement of work.

19.00. MISCELLANEOUS.

- 19.01. GIVING NOTICE.** Whenever any provision of the Contract Documents requires the giving of written notice it shall be deemed to be validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by first class, registered or certified mail, postage prepaid, to the business address provided on the Contractual Agreement, or by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.
- 19.02. COMPUTATION OF TIME.** Computation of time shall be set forth by the number of calendar days allowed for in the contract agreement. Calendar days shall consist every day shown on the calendar.
- 19.03. ADDITIONAL SPECIFICATION REQUIREMENTS.** Areas of work not covered under Special Conditions will be required to meet specifications covered in applicable sections of Indiana Department of Transportation Specifications 2018 Edition (or latest edition and supplements at time of Bid) for the installation and placement of materials to ensure quality workmanship. INDOT Specifications shall not be interpreted to contradict current Public Works or Bloomington Utility Specifications, which shall override and supersede INDOT Specifications.
- 19.04. MAINTENANCE OF TRAFFIC.** For all maintenance of traffic, including pedestrian routes, the Contractor shall follow the current Indiana Manual on Uniform Traffic Control Devices (MUTCD) with regard to all signage and signage placement used during the project for both vehicular, bicycle and pedestrian traffic travelling through the project limits. The Contractor shall install and maintain any temporary pedestrian routes in accordance with the Draft Public Right of Way Accessibility Guidelines (PROWAG) and must be approved by the Department of Planning and Transportation.
- 19.05. LIMITATION OF DAMAGES.** With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.
- 19.06. NO WAIVER.** A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.
- 19.07. SURVIVAL OF OBLIGATIONS.** All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

SECTION VII

SPECIAL CONDITIONS
SUPPLEMENTARY CONDITIONS

Special Conditions

1. Contractor shall maintain local access for all residents and local business within the limits of the project during construction.
2. Contractor shall limit his/her operations to within the project site. Contractors using any property outside the public right of way shall have an agreement in writing from each respective property owner of said property on file with the City of Bloomington Project Representative prior to usage. No verbal agreements are permitted.
3. Contractor is responsible for securing the construction site at all times.

4) **Parking for Centerstone**

Motor vehicle and bicycle parking for Centerstone shall be provided at all times during the project. Centerstone requires accessible parking, similar to existing conditions, within close proximity to their accessible entrances. City-owned parking lots south of 1st St and west of Rogers St. may be utilized for Centerstone parking. Bicycle parking shall be provided in the form of permanent or temporary bicycle racks with a total number equal to what is currently provided. Access from City-owned parking lots to Centerstone shall be maintained in equal or better condition.

Lighting shall be provided for all areas utilized for Centerstone's parking. Prior to the start of this project, the City shall energize the existing parking lot lights utilizing power from the building at 645 S. Rogers St. The Contractor may continue to utilize the building's power for the sole purpose of providing lighting for Centerstone's parking areas.

The City will assist in coordinating changes to Centerstone's parking with Centerstone. The Contractor shall be responsible for providing any temporary lighting needed throughout the project including lighting at the parking lot south of 1st St. Existing lighting at the parking lot south of 1st St., north of 714 S. Rogers, is nonfunctioning. 714 S. Rogers does not have power service. The lighting shall be dusk to dawn, seven (7) days a week.

No direct payment shall be made for providing lighting and parking for Centerstone; the associated costs shall be included in the cost of other items.

5) **Material Testing**

Material testing as specified by the contract documents shall be provided by the Owner. The contractor is responsible for coordination of the testing with the project inspection team. The contractor shall efficiently utilize the testing services, limiting the quantity of retesting and idle time of technicians. The Owner is not responsible for any costs associated with delays related to the required testing.

6) **Printing Plan Set**

The plan set file requires the plans be downloaded to print. Attempts to print directly from the website link may result in printing issues.

7) **Earthwork Quantities & Calculations**

Refer to the Soil Management Plan, included in Appendix A, for information regarding handling of soil.

The earthwork quantity was calculated by a surface comparison between the existing surface and the subgrade surface resulted in 9,723 CY of cut and 2,126 CY of fill. This is represented by the quantity of 11,850 CY of Excavation, Common.

The project's environmental consultant, Metric, has advised that all disturbed soils shall be tested. Testing shall be provided by the City. The quantity of Regulated Materials, Remove represents the quantity of Excavation, Common plus the quantity of pipe trench excavation. Pretesting of areas to be disturbed to reduce the need for soil stockpiling can be coordinated with the project's inspection team. Areas disturbed prior to testing will require stockpiling and shall be paid for by tons of Regulated Materials, Remove.

The quantity of Regulated Materials, Transport and Dispose represents the consultant's estimate of materials requiring regulated disposal. This was calculated by creating a surface of contaminated soil, per the Phase II borings, and comparing it to the surfaces created of the subgrade and trenches.

Contaminated Soils, Stockpile shall pay for the stockpiling of excavated soils on-site prior to testing. The quantity represents a "worst case scenario" of the estimated total disturbed soil for the entire project. Tested material that does not require regulated disposal shall be incorporated into the project as fill. The goal of this item is to provide compensation to the Contractor for additional material handling associated with the required soil testing.

8) **City Utility Connections & Fees**

The contractor shall make the tap and extend the service line to the ROW line, ending in a curb stop valve.

Once all of the testing has been completed on the main, and the new services have been paid for, CBU will install the service yokes. Process for service installation:

- 1) The contractor is responsible for excavating to expose the new curb stop valve.

2) CBU will install the meter yoke and leave the barrel section of the pit, the ring and lid on site.

3) The contractor shall connect back side of service line to new yoke, place pit/ring/lid on top, then backfill to final grade.

4) Once that is completed the Contractor shall then contact CBU for the meter to be set.

The City shall be responsible for any CBU connection fees. The contractor shall be responsible for their labor, equipment and material costs associated with the connections.

9) **Detention System & Water Quality Units**

Alternate detention system materials meeting the project and City of Bloomington Utility department's requirements are acceptable.

Substituting other water quality units is acceptable if the Contractor can demonstrate that the substitution can treat the same maximum flow rate as the units specified in the Drawings and is approved by the City of Bloomington.

10) **Project Signage**

Signage advertising the Hopewell Development are currently installed on the site. The locations were determined to minimize the need for relocations, however, if a sign conflicts with the required work for the project the contractor shall relocate the sign(s). No direct payment will be made for costs associated with sign relocations.

11) **Trades Park – Sign Removal**

The sign located on the north side of 2nd Street at Building Trades Park shall be removed with this project. The removal shall include the termination of any electrical service to the sign. The costs for removal of the sign, termination of the electrical service, demo of the fountain to one foot below grade and restoration of the disturbed area with soil, topsoil and mulched seed shall be paid by lump sum bid item Building Trades Park Sign, Removal. Image of sign now covered by tarp shown for reference below.



DOCUMENT 00 01 01 –

**INFRASTRUCTURE & SITE ENGINEERING & SITE AMENITIES
CONSTRUCTION PROJECT TITLE PAGE**

Owner: City of Bloomington, Indiana .

Location: Bloomington, Indiana.

1.1 INFRASTRUCTURE & SITE ENGINEERING

- A. Engineer: Shrewsberry Associates, LLC
7321 Shadeland Station, Suite 160.
Indianapolis, Indiana 46256 .
Phone: (317) 841-4799.
Website: shrewsusa.com.



shrewsberry

- B. Engineer's Project No. 21-0049.
- C. Issued: September 6, 2022.
- D. Copyright 2022 Shrewsberry Associates, LLC. All rights reserved.

1.2 SITE AMENITIES

- A. Landscape Architect: Rundell Ernstberger Associates, Inc.
618 E. Market Street
Indianapolis, Indiana 46202
Phone: (317) 263-0127
Website: reasite.com

END OF DOCUMENT 00 01 01

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SECTION 01 1000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Contractor's use of site and premises.
 - 4. Coordination with occupants.
 - 5. Work restrictions.
 - 6. Miscellaneous provisions.
- B. Related Requirements:
 - 1. Section 01 5000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: Hopewell Infrastructure and Site Engineering, Phase 1 East.
 - 1. Project Location: Bloomington, Indiana along and between the following streets:
 - a. South Morton Street between 1st and 2nd Street.
 - b. South Madison Street between 1st and 2nd Street.
 - c. University Street between Rogers and Morton Street.
 - d. Site improvements to existing Centerstone building site.
 - e. Site improvements to Lot 2 and 6 north of Madison Street.
- B. Owner: City of Bloomington, Indiana, Engineering Department.
 - 1. Owner's Representative: Rundell Ernstberger Associates, 618 E. Market Street, Indianapolis, Indiana 46202; .
- C. Engineer: Shrewsberry and Associates, LLC; 7321 Shadeland Station, Suite 160, Indianapolis, Indiana 46256; Phone – 317.841.4799 .
 - 1. Engineer's Representative: Storm Kollak; skollak@shrewsusa.com .
- D. Engineer's Consultants: Engineer has retained the following design professionals, who have prepared designated portions of the Contract Documents:
 - 1. Land Surveyor: Bynum Fanyo and Associates, 528 N. Walnut Street, Bloomington, Indiana 47404.
 - 2. Geotechnical Engineer: Alt and Witzig Engineering, Inc., 4105 W. 99th Street, Carmel, Indiana 46032; Phone 317.875.7000
 - 3. Environmental Assessment: Metric Environmental, LLC, 6958 Hillsdale Court, Indianapolis, Indiana 46250; Phone 317.400.1633
 - 4. Landscape Architect: Rundell Ernstberger Associates, 618 E. Market Street, Indianapolis, Indiana 46202.

- E. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.
 - 1. See Section 01 3100 "Project Management and Coordination." for requirements for using web-based Project software.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
 - 1. Work consists of right of way improvements including roadway and utility improvements, landscape architecture and hardscape improvements and site improvements for the site serving the Centerstone building.
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract, consisting of separate technical specifications and drawings for Site Amenities Construction and Infrastructure and Site Engineering Construction.

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits on Use of Site: Confine construction operations to areas indicated on drawings where work is permitted.
 - 2. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.6 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy Project site and existing Centerstone building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or

used facilities without written permission from Owner and approval of authorities having jurisdiction.

2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.7 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to between 7 a.m. to 7 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
 1. Weekend Hours: Weekend hours are not permitted, unless authorized in writing by Owner, 48 hours in advance.
 2. Early Morning Hours: Are not permitted.
 3. Hours for Utility Shutdowns: Coordinate utility shutdowns with Owner's Representative.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
 1. Notify Engineer not less than two days in advance of proposed utility interruptions.
 2. Obtain Engineer's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
 1. Notify Engineer not less than two days in advance of proposed disruptive operations.
 2. Obtain Engineer's written permission before proceeding with disruptive operations.
- E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 1. Maintain list of approved screened personnel with Owner's representative.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - METHOD OF MEASUREMENT (Not Used)

PART 5 - BASIS OF PAYMENT (Not Used)

END OF SECTION 01 1000

SECTION 01 2300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other Work of the Contract.
- C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Furnish Pavilion.
 - 1. Base Bid: No furnishing or fabrication of Pavilion structure."
 - 2. Alternate: Furnish Pavilion Structure, exclusive of concrete foundations, as indicated on Drawing S103 Pavilion Structural Plans and Details; and as specified in Section 05 1200 "Structural Steel Framing" and Section 06 4013 "Exterior Architectural Woodwork."

- B. Alternate No. 2: Install Pavilion.
 - 1. Base Bid: No installation of pavilion or construction of pavilion foundations.
 - 2. Alternate: Install Pavilion Structure and foundations as indicated on Drawing S103 Pavilion Structural Plans and Details; and as specified in Section 03 3300 "Cast-in-Place Concrete". Fabrication and furnishing of Pavilion included with Alternate 1.

- C. Alternate No. 3: Extended Plant Maintenance Period.
 - 1. Base Bid: Base Bid does not include extended maintenance period for Turf Sod or Plants.
 - 2. Alternate: Provide extended maintenance required for turf sod and plants, exceeding initial maintenance requirements as specified in Section 32 9200 "Turf and Grasses" and Section 32 9300 "Plants".

PART 4 - METHOD OF MEASUREMENT (Not Used)

PART 5 - BASIS OF PAYMENT (Not Used)

END OF SECTION 01 2300

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 01 2300 "Alternates" for products selected under an alternate.
 - 2. Section 01 6000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use form acceptable to Engineer.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Certificates and qualification data, where applicable or requested.

- f. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - h. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - i. Cost information, including a proposal of change, if any, in the Contract Sum.
 - j. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - k. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Work Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - METHOD OF MEASUREMENT (Not Used)

PART 5 - BASIS OF PAYMENT (Not Used)

END OF SECTION 01 2500

SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. RFIs.
 - 3. Digital project management procedures.
 - 4. Web-based Project management software package.
 - 5. Project meetings.
- B. Related Requirements:
 - 1. Section 01 3200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 01 7300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 01 7700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

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

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.

1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Engineer will return without response those RFIs submitted to Engineer by other entities controlled by Contractor.
 - 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Owner name.
 - 3. Owner's Project number.
 - 4. Name of Engineer.
 - 5. Engineer's Project number.
 - 6. Date.
 - 7. Name of Contractor.
 - 8. RFI number, numbered sequentially.
 - 9. RFI subject.

10. Specification Section number and title and related paragraphs, as appropriate.
 11. Drawing number and detail references, as appropriate.
 12. Field dimensions and conditions, as appropriate.
 13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 14. Contractor's signature.
 15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.
- D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Engineer's actions on submittals.
 - g. RFI's without Contractor's suggested resolution.
 - h. Incomplete RFIs or inaccurately prepared RFIs.
 2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt by Engineer of additional information.
 3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 2600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within 5 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Use software log that is part of web-based Project management software. Software log with not less than the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Engineer.
 4. RFI number, including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Engineer's response was received.
 8. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

- F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven days if Contractor disagrees with response.
- G. Owner reserves the right to require adjustment to the Contract for responses to RFI's requiring Engineer's redesign or evaluation of products or materials requested by Contractor in RFI.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Engineer's CAD drawings will be provided by Engineer for Contractor's use during construction.
 - 1. Digital data files are limited for use by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
 - 2. Engineer makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 - 3. Digital Drawing Software Program: Contract Drawings are available in current version of AutoCAD digital drawing software program and Windows 10 operating system.
 - 4. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Engineer.
 - a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Engineer.
 - 5. Digital data files shall not be used for construction staking or layout unless prior written approval, including terms of use and limitations, is provided by Engineer. .
- B. Web-Based Project Management Software Package: Provide, administer, and use web-based Project management software package for purposes of hosting and managing Project communication and documentation, acceptable to Owner and Engineer, until Final Completion.
 - 1. Web-based Project management software includes, at a minimum, the following features:
 - a. Compilation of Project data, including Contractor, subcontractors, Engineer, Engineer's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
 - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
 - c. Document workflow planning, allowing customization of workflow between project entities.
 - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Field Orders, Work Change Directives, and Change Orders.
 - e. Track status of each Project communication in real time, and log time and date when responses are provided.
 - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - g. Processing and tracking of payment applications.
 - h. Processing and tracking of contract modifications.
 - i. Creating and distributing meeting minutes.

- j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
 - k. Management of construction progress photographs.
 - l. Mobile device compatibility, including smartphones and tablets.
 2. Provide up to seven Project management software user licenses for use of Owner, Engineer, and Engineer's consultants. Provide eight hours of software training for web-based Project software users.
 3. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Engineer. Provide data in locked format to prevent further changes.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.8 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times a minimum of seven days prior to meeting.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.

- g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Preparation of Record Documents.
 - o. Use of the premises.
 - p. Work restrictions.
 - q. Working hours.
 - r. Owner's occupancy requirements.
 - s. Responsibility for temporary facilities and controls.
 - t. Procedures for disruptions and shutdowns.
 - u. Construction waste management and recycling.
 - v. Parking availability.
 - w. Office, work, and storage areas.
 - x. Equipment deliveries and priorities.
 - y. First aid.
 - z. Security.
 - aa. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Owner and Engineer of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.

- s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Engineer, but no later than 30 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for delivery of material samples, attic stock, and spare parts.
 - g. Requirements for demonstration and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - j. Submittal procedures.
 - k. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at biweekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

- a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site use.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of Proposal Requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - METHOD OF MEASUREMENT (Not Used)

PART 5 - BASIS OF PAYMENT (Not Used)

END OF SECTION 01 3100

SECTION 01 3200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Construction schedule updating reports.
 - 3. Daily construction reports.
 - 4. Material location reports.
 - 5. Site condition reports.
 - 6. Unusual event reports.
- B. Related Requirements:
 - 1. Section 01 4000 "Quality Requirements" for schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. PDF file.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- C. Construction Schedule Updating Reports: Submit with Applications for Payment.
- D. Daily Construction Reports: Submit at weekly intervals.
- E. Material Location Reports: Submit at weekly intervals.
- F. Site Condition Reports: Submit at time of discovery of differing conditions.
- G. Unusual Event Reports: Submit at time of unusual event.

1.5 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - 1. Use scheduling component of Project management software package specified in Section 01 3100 "Project Management and Coordination," for current Windows operating system.
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Engineer.
 - 2. Temporary Facilities: Indicate start and completion dates for the following as applicable:
 - a. Securing of approvals and permits required for performance of the Work.
 - b. Temporary facilities.
 - c. Construction of mock-ups, prototypes and samples.
 - d. Owner interfaces and furnishing of items.
 - e. Punch list.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 3300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 3. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.

- c. Uninterruptible services.
 - d. Seasonal variations.
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and the Contract Time.
- F. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Final Completion percentage for each activity.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Distribution: Distribute copies of approved schedule to Engineer Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.7 GANTT-CHART SCHEDULE REQUIREMENTS

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice of Award.
 - 1. Base schedule on additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in five percent increments within time bar.

1.8 REPORTS

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

1. List of subcontractors at Project site.
 2. Approximate count of personnel at Project site.
 3. Material deliveries.
 4. High and low temperatures and general weather conditions, including presence of rain or snow.
 5. Testing and inspection.
 6. Accidents.
 7. Meetings and significant decisions.
 8. Unusual events.
 9. Stoppages, delays, shortages, and losses.
 10. Meter readings and similar recordings.
 11. Emergency procedures.
 12. Orders and requests of authorities having jurisdiction.
 13. Change Orders received and implemented.
 14. Work Change Directives received and implemented.
 15. Services connected and disconnected.
 16. Equipment or system tests and startups.
 17. Partial completions.
 18. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - METHOD OF MEASUREMENT (Not Used)

PART 5 - BASIS OF PAYMENT (Not Used)

END OF SECTION 01 3200

SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.
- B. Related Requirements:
 - 1. Section 01 3100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
 - 2. Section 01 3200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 3. Section 01 3233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
 - 4. Section 01 4000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
 - 5. Section 01 7700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.

1.2 DEFINITIONS

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

1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
 - 3. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.

- d. Name of subcontractor.
- e. Description of the Work covered.
- f. Scheduled date for Engineer's final release or approval.

1.4 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 1. Project name.
 2. Date.
 3. Name of Engineer.
 4. Name of Contractor.
 5. Name of firm or entity that prepared submittal.
 6. Names of subcontractor, manufacturer, and supplier.
 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 8. Category and type of submittal.
 9. Submittal purpose and description.
 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 11. Drawing number and detail references, as appropriate.
 12. Indication of full or partial submittal.
 13. Location(s) where product is to be installed, as appropriate.
 14. Other necessary identification.
 15. Remarks.
 16. Signature of transmitter.
- B. Options: Identify options requiring selection by Engineer.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Engineer on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- E. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.5 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 10 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Engineer's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

1.6 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.

- c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
 1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. 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.
 - 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer will return submittal with options selected.
 - 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit two sets of Samples. Engineer will retain one Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - 2. Manufacturer and product name, and model number if applicable.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
 - 1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.

2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.7 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract

Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S REVIEW

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

B. Contractor's Approval: Indicate Contractor's approval for each submittal with indication in web-based Project management software. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Engineer will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ENGINEER'S REVIEW

A. Action Submittals: Engineer will review each submittal, indicate corrections or revisions required, and return.

1. PDF Submittals: Engineer will indicate, via markup on each submittal, the appropriate action.

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

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.

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

E. Engineer will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Engineer without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - METHOD OF MEASUREMENT (Not Used)

PART 5 - BASIS OF PAYMENT (Not Used)

END OF SECTION 01 3300

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Owner's Representative, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
 - 1. Mockups are used for one or more of the following:
 - a. Verify selections made under Sample submittals.
 - b. Demonstrate aesthetic effects.
 - c. Demonstrate the qualities of products and workmanship.
 - d. Demonstrate successful installation of interfaces between components and systems.
 - e. Perform preconstruction testing to determine system performance.

2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
 - F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
 - G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
 - H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
 - I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
 - J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Owner's Representative.

1.4 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 Owner's Representative.
- B. Delegated Design Services Statement: Submit a statement 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Owner's Representative regarding the conflict and obtain clarification prior to

proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Owner's Representative for clarification before proceeding.

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

1.6 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.
- C. Reports: Prepare and submit certified written reports and documents as specified.
- D. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.7 REPORTS AND DOCUMENTS

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

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

1.8 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

- F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
 - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:
 - 1. Provide test specimens representative of proposed products and construction.
 - 2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - 3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - 4. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
 - 5. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Owner's Representative, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Owner's Representative.
 - 3. Notify Owner's Representative seven days in advance of dates and times when mockups will be constructed.
 - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 6. Obtain Owner's Representative's approval of mockups before starting corresponding Work, fabrication, or construction.

- a. Allow seven days for initial review and each re-review of each mockup.
7. Promptly correct unsatisfactory conditions noted by Owner's Representative's preliminary review, to the satisfaction of the Owner's Representative, before completion of final mockup.
8. Approval of mockups by the Owner's Representative does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner's Representative specifically approves such deviations in writing.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups when directed unless otherwise indicated.

1.9 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection 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, whether specified or not, to verify and document that the Work complies with requirements.
 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Owner's Representative and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 1. Notify Owner's Representative and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 3300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 6. Security and protection for samples and for testing and inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7300 "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.

PART 4 - METHOD OF MEASUREMENT (Not Used)

PART 5 - BASIS OF PAYMENT

- 5.1 Cost of testing and inspections are considered as incidental to related construction activities and will not be paid for directly.
- 5.2 Owner is responsible for on-site testing, inspection, quality assurance and quality control activities unless specifically noted otherwise in specifications.

END OF SECTION 01 4000

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. 2022 Indiana Department of Transportation Standard Specifications, Section 110, Section 628 and Section 801.
 - 2. Section 01 1000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment.

1.3 USE CHARGES

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

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, timesteps, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

1.6 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 01 1000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service:
 - 1. Install water service and distribution piping in sizes and pressures adequate for construction.
 - 2. Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Electric Power Service:
 - 1. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - a. Install electric power service overhead unless otherwise indicated.
- F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- G. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment for each field office.
 - 1. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
 - 1. Provide construction for shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
 - 2. Maintain support facilities until Owner's Representative schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel

remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.
 - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 - 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 - 2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 31 2000 "Earth Moving."
 - 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 - 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with Section 32 1216 "Asphalt Paving."
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- F. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- H. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touch up signs, so they are legible at all times.
- I. Waste Disposal Facilities:
 - 1. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 7300 "Execution."

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Section 01 1000 "Summary."
- C. Temporary Erosion and Sedimentation Control:
 - 1. Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, in accordance with erosion- and sedimentation-control Drawings.
 - a. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
 - b. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 - c. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 - d. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- F. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting and as indicated on Drawings.
- H. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of

- plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 7700 "Closeout Procedures."

PART 4 - METHOD OF MEASUREMENT

- 4.1 Maintenance of Traffic: Measurement shall be inclusive of all maintenance of traffic items indicated on Drawings, including barricades, signs, lighting and other temporary traffic control items

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Maintenance of Traffic shall be paid for at the contract unit price of Lump Sum.

END OF SECTION 01 5000

SECTION 01 5723 - TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Temporary stormwater pollution controls.
- B. Related Requirements:
 - 1. 2022 Indiana Department of Transportation Standard Specifications, Section 205.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment.

1.4 STORMWATER POLLUTION PREVENTION PLAN

- A. The Stormwater Pollution Prevention Plan (SWPPP) is part of the Contract Documents and is bound into this Project Manual.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Engineer, and earthwork subcontractor.
 - 2. Review requirements of the SWPPP, including permitting process, worker training, and inspection and maintenance requirements.

1.6 INFORMATIONAL SUBMITTALS

- A. Stormwater Pollution Prevention Plan (SWPP): Within 15 days of date established for commencement of the Work, submit completed SWPPP.
- B. EPA authorization under the EPA's "2017 Construction General Permit (CGP)."
- C. Stormwater Pollution Prevention (SWPP) Training Log: For each individual performing Work under the SWPPP.
- D. Inspection reports.

1.7 QUALITY ASSURANCE

- A. Stormwater Pollution Prevention Plan (SWPPP) Coordinator: Experienced individual or firm with a record of successful water pollution control management coordination of projects with similar requirements.
 - 1. SWPPP Coordinator shall complete and finalize the SWPPP form.

2. SWPPP Coordinator shall be responsible for inspections and maintaining of all requirements of the SWPPP.

B. Installers: Trained as indicated in the SWPPP.

PART 2 - PRODUCTS

2.1 TEMPORARY STORMWATER POLLUTION CONTROLS

- A. Provide temporary stormwater pollution controls as required by the SWPPP.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with all best management practices, general requirements, performance requirements, reporting requirements, and all other requirements included in the SWPPP.
- B. Locate stormwater pollution controls in accordance with the SWPPP.
- C. Conduct construction as required to comply with the SWPPP and that minimize possible contamination or pollution or other undesirable effects.
 1. Inspect, repair, and maintain SWPPP controls during construction.
 - a. Inspect all SWPPP controls not less than every seven days, and after each occurrence of a storm event, as outlined in the SWPPP.
- D. Remove SWPPP controls at completion of construction and restore and stabilize areas disturbed during construction.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Stormwater Management Budget will be measured at the contract unit price per Lump Sum, exclusive of temporary construction entries, silt fence, inlet protection, concrete wash off and other SWPPP elements indicated on Drawings.
- 4.2 Temporary Silt Fence, will be measured at the contract unit price per Lineal Foot completely installed, accepted, maintained and removed at time of Substantial Completion in accordance with INDOT, Section 205 requirements and requirements of this Section.
- 4.3 Temporary Inlet Protection, will be measured at the contract unit price per Each completely installed, accepted, maintained and removed at time of Substantial Completion in accordance with INDOT, Section 205 requirements and requirements of this Section.
- 4.4 Temporary Seeding, will be measured at the contract unit price per Pound completely installed, accepted, and maintained in accordance with INDOT, Section 205 requirements and requirements of this Section.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Stormwater Management Budget shall be paid for at the unit price Lump Sum.
- 5.2 The cost of Temporary Silt Fence shall be paid for at the contract unit price per Lineal Foot.
- 5.3 The cost of Temporary Inlet Protection shall be paid for at the contract unit price per Each.
- 5.4 The cost of Temporary Seeding shall be paid for at the contract unit price per Pound.

END OF SECTION 01 5723

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 01 2300 "Alternates" for products selected under an alternate.
 - 2. Section 01 2500 "Substitution Procedures" for requests for substitutions.
 - 3. Section 01770 "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 - 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 01 3300 "Submittal Procedures."
- F. Substitution: Refer to Section 01 2500 "Substitution Procedures" for definition and limitations on substitutions.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
 - 3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 7700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Engineer will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Engineer in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Engineer, whose determination is final.
- B. Product Selection Procedures:
1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
 2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
 3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
 5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
 6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
 7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 2500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 2500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Engineer from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Engineer will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- ## 2.2 COMPARABLE PRODUCTS
- A. Conditions for Consideration of Comparable Products: Engineer will consider Contractor's request for comparable product when the following conditions are

satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
- B. Engineer's Action on Comparable Products Submittal: If necessary, Engineer will request additional information or documentation for evaluation, as specified in Section 01 3300 "Submittal Procedures."
1. Form of Approval of Submittal: As specified in Section 01 3300 "Submittal Procedures."
 2. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Single-Step Process: When acceptable to Engineer, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Engineer of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

PART 4 - METHOD OF MEASUREMENT (Not Used)

PART 5 - BASIS OF PAYMENT (Not Used)

END OF SECTION 01 6000

SECTION 01 7300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering.
 - 3. Installation.
 - 4. Cutting and patching.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for coordination of Owner's separate contracts, and limits on use of Project site.

1.2 UNIT PRICES

- 1.3 Work of this Section is affected by unit prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment.

1.4 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.5 PREINSTALLATION MEETINGS

- A. Layout Conference: Conduct conference at Project site.
 - 1. Prior to establishing layout of new and existing review layout and elevations of site improvements. Review benchmark, control point, and layout and dimension requirements. Inform Engineer of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
 - a. Contractor's superintendent.
 - b. Professional surveyor responsible for performing Project surveying and layout.
 - c. Professional surveyor responsible for performing site survey serving as basis for Project design.
 - 2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
 - 3. Review requirements for including layouts on Shop Drawings and other submittals.
 - 4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor, certifying that location and elevation of improvements comply with requirements.

1.7 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. 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.
 - 2. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 - a. <Insert miscellaneous element>.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Engineer for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Engineer in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Engineer promptly.
- B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:
1. Establish benchmarks and control points to set lines and levels as needed to locate each element of Project.
 2. Establish limits on use of Project site.
 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 4. Inform installers of lines and levels to which they must comply.
 5. Check the location, level and plumb, of every major element as the Work progresses.

6. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of six permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb, and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Engineer. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Engineer. Fit exposed connections together to form hairline joints.

3.6 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."
- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Proceed with patching after construction operations requiring cutting are complete.
- G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.
- 3.7 COORDINATION OF OWNER'S PORTION OF THE WORK
- A. Site Access: Provide access to Project site for Owner's construction personnel and Owner's separate contractors.
- 3.8 PROGRESS CLEANING
- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, in accordance with regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces in accordance with written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

- F. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- G. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- H. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- I. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.11 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Construction Layout, inclusive of construction layout and field engineering, will be measured at the contract unit price per Lump Sum, inclusive of delegated design,

surveying, construction layout, field engineering and other construction layout requirements indicated in this Section.

- 4.2 Additional requirements of this Section including installation, cutting and patching, cleaning, equipment and systems starting and adjusting and construction protection is considered incidental and will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Construction Layout shall be paid for at the contract unit price Lump Sum.

END OF SECTION 01 7300

SECTION 01 7700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final Completion procedures.
 - 3. List of incomplete items.
 - 4. Submittal of Project warranties.
 - 5. Final cleaning.
- B. Related Requirements:
 - 1. Section 01 3233 "Photographic Documentation" for submitting Final Completion construction photographic documentation.

1.2 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Engineer's use prior to Engineer's inspection, to determine if the Work is substantially complete.

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include operating certificates, and similar releases.

2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
 5. Submit testing, adjusting, and balancing records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
 - 1. Submit a final Application for Payment.
 - 2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list will state that each item has been completed or otherwise resolved for acceptance.
 - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of areas in sequential order.
 - 2. Organize items applying to each area by major element.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Engineer.
 - d. Name of Contractor.
 - e. Page number.
 - 4. Submit list of incomplete items in the following format:
 - a. PDF Electronic File: Engineer will return annotated file.
 - b. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit by uploading to web-based project software site and by email to Engineer.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access on site and to building.
 - f. Clean exposed hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited-access spaces, including equipment vaults, manholes, and similar spaces.
 - h. Remove labels that are not permanent.
 - i. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - j. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
 - k. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste-disposal requirements in Section 01 5000 "Temporary Facilities and Controls."

3.2 CORRECTION OF THE WORK

- A. Complete repair and restoration operations required by "Correction of the Work" Article in Section 01 7300 "Execution" before requesting inspection for determination of Substantial Completion.

PART 4 - METHOD OF MEASUREMENT (Not Used)

PART 5 - BASIS OF PAYMENT (Not Used)

END OF SECTION 01 7700

SECTION 02 4119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected site elements.
- B. Related Requirements:
 - 1. Section 01 1000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 01 7300 "Execution" for cutting and patching procedures.
 - 3. Section 31 1000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- C. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 INFORMATIONAL SUBMITTALS

- A. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Submit before Work begins.

1.6 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.

- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

3.2 UTILITY SERVICES

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of site.

3.3 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically. Complete selective demolition operations in one area before proceeding to adjacent areas.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 6. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- 3.4 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS
- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- 3.5 DISPOSAL OF DEMOLISHED MATERIALS
- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.
- 3.6 CLEANING
- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Pavement Removal: Includes complete removal including base and subbase materials and backfill to limits indicated in accordance with requirements of this Section.
- 4.2 Curb, Remove: Includes complete removal and backfill to limits indicated in accordance with requirements of this Section.
- 4.3 Sidewalk Concrete, Remove: Includes complete removal including base materials and backfill to limits indicated in accordance with requirements of this Section.
- 4.4 Sign, Remove: Includes complete removal and backfill to limits indicated in accordance with requirements of this Section.
- 4.5 Retaining Wall, Remove: Includes complete removal including foundations, footings and backfill to limits indicated in accordance with requirements of this Section.
- 4.6 Inlet, Remove: Includes complete removal and backfill to limits indicated in accordance with requirements of this Section.
- 4.7 Manhole, Remove: Includes complete removal and backfill to limits indicated in accordance with requirements of this Section.
- 4.8 Miscellaneous Concrete, Remove: Includes complete removal including base and subbase materials and backfill to limits indicated in accordance with requirements of this Section.
- 4.9 Pipe, Remove: Includes complete removal and backfill to limits indicated in accordance with requirements of this Section.
- 4.10 Water and Service Line, Remove: Includes complete removal and backfill to limits indicated in accordance with requirements of this Section and requirements of City of Bloomington Utilities.
- 4.11 Sanitary Sewer, Remove: Includes complete removal and backfill to limits indicated in accordance with requirements of this Section and requirements of City of Bloomington Utilities.
- 4.12 Fence and Posts, Remove: Includes complete removal and backfill to limits indicated in accordance with requirements of this Section.
- 4.13 Fire Hydrant Assembly, Remove: Includes complete removal and backfill to limits indicated in accordance with requirements of this Section and requirements of City of Bloomington Utilities.
- 4.14 Light Pole, Remove: Includes complete pole and foundation removal and backfill to limits indicated in accordance with requirements of this Section. Coordinate salvage of luminaires, brackets and fixtures with Owner's Representative prior to pole removal.
- 4.15 Guardrail, Remove: Includes complete removal and backfill to limits indicated in accordance with requirements of this Section.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Pavement Removal shall be paid for at the contract unit price per Square Yard.
- 5.2 The cost of Curb, Remove shall be paid for at the contract unit price per Linear Foot.

- 5.3 The cost of Sidewalk Concrete, Remove shall be paid for at the contract unit price per Square Yard.
- 5.4 The cost of Sign, Remove shall be paid for at the contract unit price per Each.
- 5.5 The cost of Retaining Wall, Remove shall be paid for at the contract unit price per Linear Foot.
- 5.6 The cost of Inlet, Remove shall be paid for at the contract unit price per Each.
- 5.7 The cost of Manhole, Remove shall be paid for at the contract unit price per Each.
- 5.8 The cost of Miscellaneous Concrete, Remove shall be paid for at the contract unit price per Square Yard.
- 5.9 The cost of Pipe, Remove shall be paid for at the contract unit price per Linear Foot.
- 5.10 The cost of Water and Service Line, Remove shall be paid for at the contract unit price per Linear Foot.
- 5.11 The cost of Sanitary Sewer, Remove shall be paid for at the contract unit price per Linear Foot.
- 5.12 The cost of Fence and Posts, Remove shall be paid for at the contract unit price per Linear Foot.
- 5.13 The cost of Fire Hydrant Assembly, Remove shall be paid for at the contract unit price per Each.
- 5.14 The cost of Light Pole, Remove shall be paid for at the contract unit price per Each.
- 5.15 The cost of Guardrail, Remove shall be paid for at the contract unit price per Linear Foot.

END OF SECTION 02 4119

SECTION 03 3000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. INDOT and City of Bloomington Standard Specifications
 - a. Where there is a discrepancy between INDOT/City of Bloomington standard specifications and those included herein, the more stringent of the two shall apply.
 - 2. Section 31 2000 "Earth Moving" for drainage fill under slabs-on-ground.
 - 3. Section 32 1313 "Concrete Paving" for concrete pavement and walks.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.
 - 1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.
 - 2. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction joints, control joints, isolation joints, and joint-filler strips.
 - c. Semirigid joint fillers.
 - d. Vapor-retarder installation.
 - e. Anchor rod and anchorage device installation tolerances.
 - f. Cold and hot weather concreting procedures.
 - g. Concrete finishes and finishing.
 - h. Curing procedures.
 - i. Forms and form-removal limitations.

- j. Shoring and reshoring procedures.
- k. Methods for achieving specified floor and slab flatness and levelness.
- l. Floor and slab flatness and levelness measurements.
- m. Concrete repair procedures.
- n. Concrete protection.
- o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
- p. Protection of field cured field test cylinders.

1.4 ACTION SUBMITTALS

- A. Product Data: For each of the following.
 - 1. Portland cement.
 - 2. Fly ash.
 - 3. Slag cement.
 - 4. Aggregates.
 - 5. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
 - 6. Curing materials.
 - 7. Joint fillers.
 - 8. Repair materials.
- B. Design Mixtures: For each concrete mixture, include the following:
 - 1. Mixture identification.
 - 2. Minimum 28-day compressive strength.
 - 3. Durability exposure class.
 - 4. Maximum w/cm.
 - 5. Calculated equilibrium unit weight, for lightweight concrete.
 - 6. Slump limit.
 - 7. Air content.
 - 8. Nominal maximum aggregate size.
 - 9. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Shop Drawings:
 - 1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.
 - 2. Steel Reinforcement: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, materials, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splicing and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
 - 1. Installer: Include copies of applicable ACI certificates.

2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form releasing agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Curing compounds.
7. Bonding agents.
8. Adhesives.
9. Vapor retarders.
10. Semirigid joint filler.
11. Joint-filler strips.
12. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement.
7. Aggregates.
8. Admixtures:
 - a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

D. Preconstruction Test Reports: For each mix design.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

- D. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
 - 1. Include the following information in each test report:
 - a. Admixture dosage rates.
 - b. Slump.
 - c. Air content.
 - d. Seven-day compressive strength.
 - e. 28-day compressive strength.
 - f. Permeability.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.
- B. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
 - 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 3. Do not use frozen materials or materials containing ice or snow.
 - 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
 - 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
 - 1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

- A. Source Limitations:
 - 1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
 - 2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
 - 3. Obtain aggregate from single source.
 - 4. Obtain each type of admixture from single source from single manufacturer.
- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C150/C150M, Type I/II.
 - 2. Fly Ash: ASTM C618, Class C or F.
 - 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
 - 4. Silica Fume: ASTM C1240 amorphous silica.
- C. Normal-Weight Aggregates: ASTM C33/C33M, Class 4S, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving 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.
- D. Air-Entraining Admixture: ASTM C260/C260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Permeability-Reducing Admixture: ASTM C494/C494M, Type S, hydrophilic, permeability-reducing crystalline admixture, capable of reducing water absorption of concrete exposed to hydrostatic pressure (PRAH).
 - a. Permeability: No leakage when tested in accordance with U.S. Army Corps of Engineers CRD C48 at a hydraulic pressure of 200 psi for 14 days.
- F. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.3 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - a. BASF Corporation; MasterKure ER 50.
 - b. ChemMasters, Inc; Spray-Film.
 - c. Dayton Superior; AquaFilm Concentrate J74.
 - d. Euclid Chemical Company (The); an RPM company; Eucobar.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
- D. Water: Potable or complying with ASTM C1602/C1602M.
- E. Clear, Waterborne, Membrane-Forming, Curing Compound: ASTM C309, Type 1, Class B, 18 to 25 percent solids, nondissipating.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - a. BASF Corporation; MasterKure CC 180 WB.
 - b. Dayton Superior; Cure & Seal 1315 J22WB.
 - c. Euclid Chemical Company (The); an RPM company; EverClear VOX.
 - d. Vexcon Chemicals Inc.; StarSeal 800.

2.4 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.5 REPAIR MATERIALS

- A. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.6 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash or Other Pozzolans: 25 percent by mass.
 2. Slag Cement: 50 percent by mass.
 3. Silica Fume: 10 percent by mass.
 4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
 5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
 1. Use water reducing] admixture in concrete, as required, for placement and workability.
 2. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs concrete required to be water tight, and concrete with a w/cm below 0.50.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
 - 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
 - 1. Daily access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
 - 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
 - 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with site slab pattern and concrete placement sequence.
 - 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 - 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

4. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
 5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 07 9200 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
 2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.
- F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 - 1. If a section cannot be placed continuously, provide construction joints as indicated.
 - 2. Deposit concrete to avoid segregation.
 - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Do not place concrete floors and slabs in a checkerboard sequence.
 - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 3. Maintain reinforcement in position on chairs during concrete placement.
 - 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 5. Level concrete, cut high areas, and fill low areas.
 - 6. Slope surfaces uniformly to drains where required.
 - 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 - 8. Do not further disturb slab surfaces before starting finishing operations.

3.6 FINISHING FORMED SURFACES

- A. Rubbed Finish: Apply the following to as cast surface finishes where indicated on Drawings:
 - 1. Grout-Cleaned Rubbed Finish:
 - a. Clean concrete surfaces after contiguous surfaces are completed and accessible.
 - b. Do not clean concrete surfaces as Work progresses.
 - c. Mix 1 part portland cement to 1-1/2 parts fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint. Add white portland cement in

amounts determined by trial patches, so color of dry grout matches adjacent surfaces.

- d. Wet concrete surfaces.
- e. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap, and keep surface damp by fog spray for at least 36 hours.
- f. Maintain required patterns or variances as shown on Drawings or to match mockups.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4500 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.

3.8 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. If forms remain during curing period, moist cure after loosening forms.
3. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.

3.9 TOLERANCES

- A. Conform to ACI 117.

3.10 CONCRETE SURFACE REPAIRS

- A. Defective Concrete:
 1. Repair and patch defective areas when approved by Architect.
 2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
 - a. Limit cut depth to 3/4 inch.
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.
 - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.
- D. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- E. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.11 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.

- 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 3. Slump Flow: ASTM C1611/C1611M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
 6. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure two sets of two 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
 - b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.

9. 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.
10. Additional Tests:
 - a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.12 PROTECTION

- A. Protect concrete surfaces as follows:
 1. Protect from petroleum stains.
 2. Diaper hydraulic equipment used over concrete surfaces.
 3. Prohibit vehicles from interior concrete slabs.
 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
 5. Prohibit placement of steel items on concrete surfaces.
 6. Prohibit use of acids or acidic detergents over concrete surfaces.
 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Retaining Wall, Type 1 will be measured at the unit price per Lineal Foot.
- 4.2 Retaining Wall, Type 2 will be measured at the unit price per Lineal Foot.
- 4.3 Concrete Steps will be measured at the unit price per Cubic Yard.
- 4.4 Utility Access Trench will be measured at the unit price per Lineal Foot.
- 4.5 Footing, Pavilion will be measured at the unit price per Cubic Yard.
- 4.6 All excavation, accessories, reinforcing, admixtures, joint materials, trench grates and frames, incidental materials, and work necessary for a complete installation of Retaining Wall, Concrete will not be measured for payment.
- 4.7 Cast-in-Place Concrete, including all excavation, accessories, reinforcing, admixtures, joint materials, aggregates, subgrade compaction, incidental materials, and work

necessary for a complete installation, as a part of other pay items, will not be measured for payment.

- 4.8 BASIS OF PAYMENT Cast-in-Place Concrete, including all excavation, accessories, reinforcing, admixtures, joint materials, incidental materials, and work necessary for a complete installation, as a part of other pay items, will not be measured for payment.

PART 5 -

- 5.1 The cost of Retaining Wall, Type 1, shall be paid for at the unit price per Lineal Foot.
- 5.2 The cost of Retaining Wall, Type 2, shall be paid for at the unit price per Lineal Foot.
- 5.3 The cost of Concrete Steps shall be paid for at the unit price per Cubic Yard.
- 5.4 The cost of Utility Access Trench shall be paid for at the unit price.
- 5.5 The cost of Footing, Pavilion shall be paid for at the Cubic Yard.
- 5.6 The cost of excavation, accessories, reinforcing, admixtures, joint materials, trench grates and frames, incidental materials, and work necessary for a complete installation of Retaining Wall, Concrete shall be included in the cost of Retaining Wall, Concrete.
- 5.7 The cost of Cast-in-Place Concrete, including all excavation, accessories, reinforcing, admixtures, joint materials, aggregates, subgrade compaction, incidental materials, and work necessary for a complete installation, as a part of other pay items, shall be included in the cost of those respective pay items of which they are a part of.
- 5.8 Payment will be made under:

A.	<u>Pay Item</u>	<u>Pay Unit</u>
	Retaining Wall, Type 1	LINEAL FOOT
	Retaining Wall, Type 2	LINEAL FOOT
	Concrete Steps	CUBIC YARD
	Utility Access Trench	LINEAL FOOT
	Footing, Pavilion	CUBIC YARD

- 5.9 This price and payment will be full compensation for furnishing the pay item noted above.
- 5.10 The cost of all excavation, accessories, reinforcing, admixtures, joint materials, incidental materials, and work necessary for a complete installation shall be included in the cost of the pay item.

END OF SECTION 03 3000

SECTION 04 4400- SITE MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Limestone quarry blocks.
- B. Related Requirements:
 - 1. Section 03 3000 "Cast-in-Place Concrete"
 - 2. Section 13 1213 "Exterior Fountains"
 - 3. Section 31 2000 "Earth Moving"

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each variety of stone, stone accessory, and manufactured product.
 - 1. Product Certificates: For materials manufactured within 100 miles (160 km) of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.
- B. Samples for Initial Selection: For colored mortar and other items involving color selection.
- C. Samples for Verification:
 - 1. For each stone type indicated. Include at least two Samples in each set and show the full range of color and other visual characteristics in completed Work.
 - 2. For each color of mortar required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, supply sources, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.
 - 1. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents contained in mockups unless Architect approves such deviations in writing.

C. Material Test Reports:

1. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer who employs experienced stone masons and stone fitters who are skilled in installing stone assemblies similar in material, design, and extent to those indicated for this Project and whose projects have a record of successful in-service performance.

B. Fabricator Qualifications:

1. Fabricators shall be established firms regularly engaged in the fabrication of stone types indicated.
2. They shall have adequate equipment and qualified personnel to fabricate quality stone products with past experience in the fabrication for projects of a similar nature in quantity required for not less than the past five (5) years.

C. Field Dimensions:

1. Check dimensions of supporting structure at the site by accurate field measurements.
2. Coordinate fabrication schedule with construction progress as directed by the Contractor to avoid delay of the work.
3. Where necessary, proceed without field measurements and coordinate installation tolerances to insure proper fit of stonework.

D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for each type of stone masonry in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.
 - a. Include stone coping at top of mockup.
 - b. Include a sealant-filled joint at least 16 inches long in mockup.
 - c. Include through-wall flashing installed for a 24-inch length in corner of mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit stone masonry above half of flashing).
 - d. Include studs, sheathing, veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup.
3. Protect accepted mockups from the elements with weather-resistant membrane.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, in a dry location, or in covered weatherproof dispensing silos.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
- E. Loading and Shipment:
 - 1. Stone supplier shall carefully pack stone for transportation and exercise all customary and reasonable precautions against damage in transit.
 - 2. All cut stone under this contract shall be loaded and shipped in the sequence mutually agreed upon by the General Contractor or Erector and the Material Supplier.
 - 3. Do not use pinch or wrecking bars without protecting edges of stone with wood or other rigid materials.
 - 4. Lift with wide-belt type slings wherever possible; do not use wire rope or ropes containing tar or other substances that might cause staining.
 - 5. Use wood rollers and provide cushion at end of wood slides.
- F. Unloading and Storage at Job Site:
 - 1. Receive and unload at the site with necessary care in handling to avoid damaging or soiling.
 - 2. Stone shall be stored clear of the ground on non-staining skids (cypress, white pine, poplar, or yellow pine without an excessive amount of resin).
 - a. Chemically treated wood should not be used.
 - b. DO NOT use chestnut, walnut, oak, certain firs, and other woods containing tannin.
 - c. Store stone on wood skids or pallets, covered with non-staining waterproof membrane.
 - d. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones.
 - e. Protect stored stone from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around stones.

1.8 FIELD CONDITIONS

- A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining stone masonry face.
 - 1. Protect base of walls from rain-splashed mud and mortar splatter using coverings spread on the ground and over the wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1.9 COORDINATION

- A. Advise installers of adjacent Work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone masonry.
- B. Coordinate locations of dovetail slots installed in concrete that are to receive stone anchors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from single quarry, whether specified in this Section or in another Section of the Specifications, with resources to provide materials of consistent quality in appearance and physical properties.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.
- C. Varieties and Sources: Subject to compliance with requirements, provide stone of varieties and from sources complying with Section 04 4200 "Exterior Stone Cladding."

2.2 INDIANA LIMESTONE

- A. Material Standard:
 - 1. Comply with ASTM C 568.
 - 2. Classification: Category II (Medium Density)

- B. Description: Oolitic limestone.
- C. Varieties and Sources: Indiana limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.
 - 1. Indiana Limestone Grade and Color for Site Wall Veneer and Solid Limestone Quarry Blocks: Variegated, according to grade and color classification established by ILI.
 - a. No distinct veining shall be present in any stone provided, variegated or otherwise.
- D. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
 - 1. Refer to construction drawings for finishes.

2.3 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Aggregate: ASTM C 144 and as follows:
 - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.
 - 2. White Aggregates: Natural white sand or ground white stone.
 - 3. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
 - a. Match Architect's sample.
- E. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- F. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Euclid Chemical Company (The); an RPM company.
 - 2. Grace Construction Products; S.R. Grace & co.
 - 3. Conn.; Moreset Sonneborn, Trimix NCA
- G. Water: Potable.

2.4 STONE ANCHORS

- A. Stone Trim Anchors: Units fabricated with tabs or dowels designed to engage kerfs or holes in stone trim units and holes for fasteners or post installed anchor bolts for fastening to substrates or framing as indicated.
- B. Materials: Fabricate anchors from stainless steel, ASTM A 240/A 240M or ASTM A 666, Type 304. Fabricate dowels from stainless steel, ASTM A 276, Type 304.
- C. Fasteners for Stone Trim Anchors: Annealed stainless-steel bolts, nuts, and washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.
- D. Postinstalled Anchor Bolts for Fastening Stone Trim Anchors: Chemical anchors or torque-controlled expansion anchors made from stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or Type 316, for anchors.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
- B. Cementitious Dampproofing for Limestone: Cementitious formulation recommended by ILI and nonstaining to stone, compatible with joint sealants, and noncorrosive to veneer anchors and attachments.

2.6 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

2.7 FABRICATION

- A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.
 - 1. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."
- B. Cut, Split, or Select stone to produce pieces of thickness, size, and shape indicated, including details on Drawings and pattern specified in "Setting Stone Masonry" Article.
 - 1. Shape stone specified to be laid as detailed.
- C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.
- D. Cut and drill sinkages and holes in stone for anchors and supports.

- E. Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.
 - 1. Clean sawed backs of stone to remove rust stains and iron particles.
- F. Thickness of Stone: Provide thickness indicated, but not less than the following:
 - 1. Thickness: 4 inches plus or minus 1/4 inch. Thickness does not include projection of pitched faces.
- G. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples and mockups.

2.8 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
 - 4. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Stone Masonry: Comply with ASTM C 270.
 - 1. Mortar for Setting Stone: Type S.

2.12 STONE FABRICATION

- A. Fabricate stonework in sizes and shapes and jointing required to comply with requirements indicated, including details on Drawings and final shop drawings.
- B. Cut exposed plane faces true to line and square, and as follows:
 - 1. Dress beds and joints straight and unless otherwise shown, at right angles to the face.
 - 2. Cut drip on underside of all overhangs.
 - 3. Cut for reglets for flashings, etc., where so indicated on Drawings.
 - 4. Carefully execute molded work.
 - 5. Arrises shall be sharp and true.
 - 6. Joints shall match perfectly.

- C. Comply with recommendations of the Indiana Limestone Institute (ILI) as published in the "Indiana Limestone Handbook".
- A. Cutting for Dowels, Anchors, Cramps, and Lewis Holes:
 - 1. Cut holes and sinkages in stones for all anchors, cramps, dowels, etc., as per industry standard practices.
 - 2. Stones that cannot be handled manually shall be provided with either lewis pin holes or a clamp hole as a service to the setter.
 - 3. Stones less than 3 1/2" thickness will be provided with a clamp hole, unless responsibility is assumed by the Contractor for the use of lewis pins.
 - 4. Size and location of the clamp hole shall be furnished by the Contractor to the stone supplier in ample time for the stone supplier to drill the required hole during the course of normal fabrication.
- B. Cutting and Drilling for Other Trades:
 - 1. All miscellaneous cutting and drilling of stone necessary to accommodate other trades shall be done by the cut stone fabricator with necessary information furnished in time to be shown on his shop drawings and details and when work can be executed before shipment.
 - 2. Cutting and fitting due to job site conditions will be the responsibility of the Field Erection Contractor.
- C. Cut stones to produce pieces of thickness, size and shape indicated or required and within fabrication tolerances recommended by applicable stone association or, if none, stone source, for faces, edges, beds, and backs.
 - 1. Control depth of stones and back-check to maintain 1" minimum clearance between backs of stones and surfaces or projections of structural members, back-up walls and other work behind stones.
 - 2. Cut stones to produce joints of uniform width and in locations indicated.
 - 3. Clean saw backs of stones to remove rust stains and free iron particles.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone masonry.
- B. Examine substrate to verify that dovetail slots, inserts, reinforcement, veneer anchors, flashing, and other items installed in substrates and required for or extending into stone masonry are correctly installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coat concrete and unit masonry backup with asphalt dampproofing.

- B. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 SETTING STONE MASONRY

- A. Perform necessary field cutting and trimming as stone is set.
 - 1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.
 - 2. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.
 - 3. Pitch face at field-split edges as needed to match stones that are not field split.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange stones in coursed pattern with joint widths within tolerances indicated.
- D. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place.
- E. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
- F. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 1/4 inch at narrowest points or more than 3/8 inch at widest points.
- G. Provide sealant joints of widths and at locations indicated.
 - 1. Keep sealant joints free of mortar and other rigid materials.
 - 2. Sealant joints are specified in Section 07 9200 "Joint Sealants."
- H. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.
 - 1. Use wicking material or open head joints to form weep holes.
 - 2. Use wicking material to form weep holes above flashing in stone sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 - 3. Space weep holes 24 inches o.c.
 - 4. Space weep holes formed from plastic tubing or wicking material 24 inches o.c.
 - 5. Trim wicking material used in weep holes flush with exterior wall face after mortar has set.
 - 6. Place pea gravel in cavities as soon as practical to a height of not less than 2 inches above top of flashing, to maintain drainage.
 - 7. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

- I. Install vents in head joints at top of each continuous cavity at spacing indicated. Use round plastic tubing] rectangular plastic tubing mesh weep holes/vents vinyl weep holes/vents or open head joints to form vents.
 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.
- J. Coat limestone with cementitious dampproofing as follows:
 1. Stone at Grade: Beds, joints, and back surfaces to at least 4 inches above finish-grade elevations.
 2. Stone Extending below Grade: Beds, joints, back surfaces, and face surfaces below grade.
 3. Allow cementitious dampproofing formulations to cure before setting dampproofed stone. Do not damage or remove dampproofing in the course of handling and setting stone.

3.4 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet or 3/4 inch in 40 feet or more.
- D. For solid quarry blocks, measure variation from level, plumb, and position shown in plan as a variation of the average plane of each stone face from level, plumb, or dimensioned plane.
- E. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.
- F. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

3.5 EXCESS MATERIALS AND WASTE

- A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.
 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other waste, and legally dispose of off Owner's property.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Limestone Quarry Block (Ramp) will be measured at the unit price per Lump Sum.
- 4.2 Limestone Stepper, Type A will be measured at the unit price per Each.
- 4.3 Limestone Stepper, Type B will be measured at the unit price per Each.
- 4.4 Limestone Stepper, Type C will be measured at the unit price per Each.
- 4.5 Limestone Block Cluster, Group 1 will be measured at the unit price per Lump Sum.
- 4.6 Limestone Block Cluster, Group 2 will be measured at the unit price per Lump Sum.
- 4.7 Limestone Block Cluster, Group 3 will be measured at the unit price per Lump Sum.
- 4.8 Limestone, Headwall will be measured at the unit price per Lump Sum.
- 4.9 Reinforcing, joint material, joint sealants, dowels, cast-in-place concrete, excavation, backfill, aggregates, geotextiles, incidental materials, and work necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Limestone Quarry Block (Ramp) shall be paid for at the unit price per Lump Sum.
- 5.2 The cost of Limestone Stepper, Type A shall be paid for at the unit price per Each.
- 5.3 The cost of Limestone Stepper, Type B shall be paid for at the unit price per Each.
- 5.4 The cost of Limestone Stepper, Type C shall be paid for at the unit price per Each.
- 5.5 The cost of Limestone Block Cluster, Group 1 shall be paid for at the unit price per Lump Sum.
- 5.6 The cost of Limestone Block Cluster, Group 2 shall be paid for at the unit price per Lump Sum.
- 5.7 The cost of Limestone Block Cluster, Group 3 shall be paid for at the unit price per Lump Sum.
- 5.8 The cost of Limestone, Headwall shall be paid for at the unit price per Lump Sum.
- 5.9 The cost of all reinforcing, joint material, joint sealants, dowels, cast-in-place concrete, excavation, backfill, aggregates, geotextiles, incidental materials, and work necessary

for a complete installation, shall be included in the cost of those respective pay items of which they are a part of.

5.10 Payment will be made under:

A. <u>Pay Item</u>	<u>Pay Unit</u>
Limestone Quarry Block (Ramp)	LUMP SUM
Limestone Stepper, Type A	EACH
Limestone Stepper, Type B	EACH
Limestone Stepper, Type C	EACH
Limestone Block Cluster, Group 1	LUMP SUM
Limestone Block Cluster, Group 2	LUMP SUM
Limestone Block Cluster, Group 3	LUMP SUM
Limestone, Headwall	LUMP SUM

5.11 This price and payment will be full compensation for furnishing all pay items noted above.

END OF SECTION 04 4313.13

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for steel lintels not attached to structural-steel frame, miscellaneous steel fabrications and other steel items not defined as structural steel.

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
- C. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.
- D. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate locations and dimensions of protected zones.
 - 5. Identify demand critical welds.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
 - 2. Electrode manufacturer and trade name, for demand critical welds.
- D. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data prepared by a qualified professional engineer.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Nonshrink grout.
- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control and special inspection reports.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that has fabricated similar size projects within the past five years.

- B. Installer Qualifications: A qualified installer who has erected similar size projects within the past five years.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear and moment connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC 360.
- B. Moment Connections: Type PR, partially restrained.
- C. Construction: Moment frame.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels, Angles, S-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.
- E. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325M (ASTM A 325), Type 1, heavy-hex steel structural bolts; ASTM A 563M, Class 8S (ASTM A 563, Grade C,) heavy-hex carbon-steel nuts; and ASTM F 436M (ASTM F 436), Type 1, hardened carbon-steel washers; all with plain finish.
- B. Unheaded Anchor Rods: ASTM A 36/A 36M.
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A 563M (ASTM A 563) heavy-hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436M (ASTM F 436), Type 1, hardened carbon steel.
 - 5. Finish: Plain.
- C. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Nuts: ASTM A 563M (ASTM A 563) heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436M (ASTM F 436), Type 1, hardened carbon steel.
 - 4. Finish: Plain.
- D. Threaded Rods: ASTM A 36/A 36M.
 - 1. Nuts: ASTM A 563M (ASTM A 563) heavy-hex carbon steel.
 - 2. Washers: ASTM A 36/A 36M carbon steel.
 - 3. Finish: Plain.
- E. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.
- F. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.
- G. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.4 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanizing Repair Paint: ASTM A 780/A 780M.

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning.", SSPC-SP 2, "Hand Tool Cleaning." or SSPC-SP 3, "Power Tool Cleaning."
- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 50 mm (2 inches).
 - 2. Surfaces to be field welded.
 - 3. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 4. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 0.038 mm (1.5 mils). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize all lintels located in exterior walls.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates: Clean concrete-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: [Snug tightened] [Pretensioned] [Slip critical].
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
1. Verify structural-steel materials and inspect steel frame joint details.

2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- 3.6 REPAIRS AND PROTECTION
- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Structural Steel Framing, including all metal fabrication, excavation, accessories and incidental materials, and work necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of all Structural Steel Framing, including all metal fabrication, excavation, accessories and incidental materials, and work necessary for a complete installation, shall be included in the cost of the pay items of which they are a part of.

END OF SECTION 051200

SECTION 053100 - STEEL DECKING

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. Composite floor deck.
- B. Related Requirements:
 - 1. Section 03 3000 "Cast-in-Place Concrete" for normal-weight structural concrete fill over steel deck.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.1 COMPOSITE FLOOR DECK

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

- a. Canam Steel Corp.;The Canam Manac Group.
- b. Consolidated Systems, Inc.
- c. Metal Dek Group
- d. New Millennium Building Systems, LLC.
- e. Nucor Corp.; Vulcraft Division.
- f. Roof Deck, Inc.
- g. United Steel Deck, Inc.

- B. Fabrication of Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with SDI C, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G90 zinc coating.
2. Profile Depth: 1-1/2 inches.
3. Design Uncoated-Steel Thickness: 0.0358 inch.
4. Span Condition: Triple span or more.

2.2 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, 4.8-mm (No. 10) minimum diameter.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: 3/4 inch, nominal.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units at each support. Space welds 12 inches on center.

- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding 18 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, 4.8-mm- (No. 10) diameter or larger, carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 38 mm (1-1/2 inches), with end joints as follows:
 - 1. End Joints: Butted.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Prepare test and inspection reports.

3.5 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of

deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Steel Decking, including all metal fabrication, cast-in-place concrete, excavation, accessories and incidental materials, and work necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of all Steel Decking, including all metal fabrication, cast-in-place concrete, excavation, accessories and incidental materials, and work necessary for a complete installation, shall be included in the cost of the pay items of which they are a part of.

END OF SECTION 053100

SECTION 05 5213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Stainless steel railings.
- B. Related Requirements:
 - 1. Section 03 3000 "Cast-in-Place Concrete."

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Expanded metal infill panels.
 - 3. Perforated metal infill panels.
 - 4. Woven-wire mesh infill panels.
 - 5. Fasteners.
 - 6. Post-installed anchors.
 - 7. Handrail brackets.
 - 8. Shop primer.
 - 9. Intermediate coats and topcoats.
 - 10. Bituminous paint.
 - 11. Nonshrink, nonmetallic grout.
 - 12. Anchoring cement.
 - 13. Metal finishes.
 - 14. Paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters, including finish.
 2. Fittings and brackets.
 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of connecting and finishing members at intersections.
- E. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For delegated design professional engineer and testing agency.
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.
- D. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.
- E. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design railings, including attachment to building construction.

- B. Structural Performance: Railings, including attachment to building construction, withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.
- 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 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STAINLESS STEEL RAILINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. [Jerico Metal Specialties, 1111 W. 17th St./PO Box 7016, Bloomington, IN 47404, 812-339-3182.](#)
 - 2. [Or approved equal.](#)
- B. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- C. Tubing: ASTM A554, Grade MT 304.
- D. Pipe: ASTM A312/A312M, Grade TP 304.

2.4 FASTENERS

- A. Fastener Materials:
 - 1. Stainless Steel Railing Components: Type 304 stainless steel fasteners.
 - 2. Finish exposed fasteners to match appearance, including color and texture, of railings.

- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 - 2. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
 - 1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
 - 1. For stainless steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
 - 1. Clearly mark units for reassembly and coordinated installation.
 - 2. Use connections that maintain structural value of joined pieces.
- C. Form work true to line and level with accurate angles and surfaces.
- D. Fabricate connections that are exposed to weather in a manner that excludes water.
 - 1. Provide weep holes where water may accumulate.
 - 2. Locate weep holes in inconspicuous locations.
- E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- F. Connections: Fabricate railings with welded connections unless otherwise indicated.

- G. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.
 - H. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - I. Form changes in direction as follows:
 - 1. As detailed.
 - J. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
 - K. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
 - L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
 - M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
 - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 - 2. Coordinate anchorage devices with supporting structure.
 - O. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- 2.7 STEEL AND IRON FINISHES
- A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.
 - B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3.
 - 1. Railings Indicated To Receive Primers Specified in Section 09 9600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3.

- C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
- D. Shop-Painted Finish: Comply with Section 09 9600 "High-Performance Coatings."
 - 1. Color: As selected by Architect from manufacturer's full range.
- E. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1 for shop painting. Apply at spreading rates recommended by coating manufacturer.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.8 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Stainless Steel Pipe and Tubing Finishes:
 - 1. Directional Satin Finish: ASTM A480/A480, No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
 - 1. Fit exposed connections together to form tight, hairline joints.
 - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 - 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws, using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

- A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink metallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink metallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, [attached to post with setscrews.

3.5 CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

PART 4 - METHOD OF MEASUREMENT

- 4.1 SST Handrail and Post will be measured at the unit price per Lineal Foot.
- 4.2 Delegated design, excavation, accessories, concrete, grout, joint materials, steel, incidental materials, and work necessary for a complete installation of Railing, Stainless will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of SST Handrail and Post shall be paid for at the unit price per Lineal Foot.
- 5.2 The cost of delegated design, excavation, accessories, concrete, grout, joint materials, steel, incidental materials, and work necessary for a complete installation of Railing, Stainless shall be included in the cost of Retaining Wall, Concrete.
- 5.3 Payment will be made under:
 - A.

<u>Pay Item</u>	<u>Pay Unit</u>
SST Handrail and Post	LINEAL FOOT
- 5.4 This price and payment will be full compensation for furnishing the pay item noted above.

END OF SECTION 05 5213

SECTION 05 7000 - DECORATIVE METAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Decorative metal.
- B. Related Requirements:
 - 1. Section 32 3300 “Site Furnishings” for custom site furnishings.

1.2 COORDINATION

- A. Coordinate installation of anchorages for decorative metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including finishing materials.
- B. Shop Drawings: Show fabrication and installation details for decorative metal.
 - 1. Include plans, elevations, component details, and attachment details.
 - 2. Indicate materials and profiles of each decorative metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Samples for Verification: For each type of exposed finish.
 - 1. Samples of welded joints showing quality of workmanship and color matching of materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Mill Certificates: Signed by manufacturers of stainless steel certifying that products furnished comply with requirements.
- C. Welding certificates.

1.5 QUALITY ASSURANCE

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

- B. Installer Qualifications: Fabricator of products.
- C. Powder-Coating Applicator Qualifications (if used): A firm experienced in successfully applying powder coatings of type indicated and employing competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
 - 4. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store decorative metal in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.
- B. Deliver and store cast-metal products in wooden crates surrounded by enough packing material to ensure that products are not cracked or otherwise damaged.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with decorative metal by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 DECORATIVE METAL FABRICATORS

- A. Fabricator: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. Bomar, 3838 S. Arlington Ave., Indianapolis, IN 46203, 317-899-1240.
 - 2. LINEL, 101 Linel Drive, Mooresville, IN 46158, 317-831-5314
 - 3. D&V Precision Sheet Metal, Inc., 205 S. 400 W., Greenfield, IN 46140, 317-462-2601.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Use materials with smooth, flat surfaces unless otherwise indicated. Use materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.3 STEEL AND IRON

- A. Tubing: ASTM A500/A500M (cold formed).
- B. Bars: Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.
- C. Plates, Shapes, and Bars: ASTM A36/A36M.
- D. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M unless otherwise indicated.
- E. Steel Sheet, Cold Rolled: ASTM A1008/A1008M, either commercial steel or structural steel, exposed.

2.4 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Uncoated-Steel Items: Type 304 stainless steel fasteners.
 - 2. Dissimilar Metals: Type 304 stainless steel fasteners.
- B. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.
- C. Provide concealed fasteners for interconnecting components and for attaching decorative metal items to other work unless otherwise indicated.
 - 1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
 - 1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Section 09 9600 "High-Performance Coatings."
- C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

- D. Intermediate Coats and Topcoats for Steel: Provide products that comply with Section 09 9600 "High-Performance Coatings."

2.6 FABRICATION, GENERAL

- A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly.
 - 1. Disassemble units only as necessary for shipping and handling limitations.
 - 2. Clearly mark units for reassembly and coordinated installation.
 - 3. Use connections that maintain structural value of joined pieces.
- B. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged.
 - 1. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes.
 - 2. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.
- C. Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- E. Form simple and compound curves in bars, pipe, tubing, and extruded shapes by bending members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces.
- F. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- G. Mill joints to a tight, hairline fit. Cope or miter corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.
- H. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.
- I. Provide necessary rebates, lugs, and brackets to assemble units and to attach to other work. Cut, reinforce, drill, and tap as needed to receive finish hardware, screws, and similar items unless otherwise indicated.
- J. Comply with AWS for recommended practices in shop welding. Weld behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.

1. Where welding cannot be concealed behind finished surfaces, finish joints to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 Welds: no evidence of a welded joint.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.8 STEEL AND IRON FINISHES

- A. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- B. Primer Application: Apply shop primer to prepared surfaces of items unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 1. Shop prime uncoated ferrous-metal surfaces with primers specified in Section 09 9600 "High-Performance Coatings" as indicated.
 2. Do not apply primer to galvanized surfaces.
- C. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
 1. Color: As selected by Architect.
- D. Powder-Coat Finish, Nongalvanized (if used): Prepare, treat, and coat nongalvanized ferrous metal to comply with resin manufacturer's written instructions and as follows:
 1. Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Treat prepared metal with iron-phosphate pretreatment, rinse, and seal surfaces.
 3. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils.
 4. Color: As selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative metal.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Provide anchorage devices and fasteners where needed to secure decorative metal to in-place construction.
- B. Perform cutting, drilling, and fitting required to install decorative metal. Set products accurately in location, alignment, and elevation, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.
- C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shopfitting and jointing of decorative metal, restore finishes to eliminate evidence of such corrective work.
- D. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- E. Install concealed gaskets, joint fillers, insulation, and flashings as work progresses.
- F. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.
 - 1. Retain protective coverings intact; remove coverings simultaneously from similarly finished items to preclude nonuniform oxidation and discoloration.
- G. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal arc welding and requirements for welding and for finishing welded connections in "Fabrication, General" Article. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- H. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 CLEANING AND PROTECTION

- A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.
- B. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
 - 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 9600 "High-Performance Coatings."

- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.
- D. Protect finishes of decorative metal from damage during construction period with temporary protective coverings approved by decorative metal fabricator. Remove protective covering at time of Substantial Completion.
- E. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Decorative Metal, including all accessories, labor, and incidental materials will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Decorative Metal, including all accessories, labor, and incidental materials shall be included in the cost of the pay item of which they are a part of.

END OF SECTION 05 7000

SECTION 06 4013 - EXTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wood louvers for Pavilion and Swing Structure.
 - 2. Wood for exterior seating.
 - 3. Wood for Screen Wall.
- B. Pavilion and swing fabricators shall source thermally modified red oak from wood manufacturer listed below.
- C. All thermally modified red oak on project shall be sourced from one manufacturer.
- D. Related Sections include the following:
 - 1. Section 05 1200 "Structural Steel Framing"
 - 2. Section 05 7000 "Decorative Metal"
 - 3. Section 03 3000 "Cast-in-Place Concrete"
 - 4. Section 06 2013 "Exterior Finish Carpentry"
 - 5. Section 32 3300 "Site Furnishings"

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product and process indicated and incorporated into items of exterior architectural woodwork during fabrication, finishing, and installation.
 - 1. Include data for wood-preservative treatment from treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - 2. Include data for fire-retardant treatment from treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of blocking and nailers, including concealed blocking and reinforcement specified in other Sections.
- C. Samples for Verification:
 - 1. Sample 50 sq. in. lumber of chosen wood species, for each finish type and color.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Thermally Modified Red Oak: 10% of total wood supplied in standard board lengths and widths.
 - 2. Finish:

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Minimum 5 years' experience installing similar products, of similar size and scope of Project.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of exterior architectural woodwork indicated for construction, finishes, installation, and other requirements.
- D. Surface Burning Characteristics
 - 1. Red Oak: UL Class B finish achieves the following results when test in accordance with ASTM E84:
 - a. Flame Spread Index (FSI): No greater than 35
 - b. Smoke Developed Index (SDI):
- E. Biological Durability Testing: Achieves the following results when tested in accordance with European Test Standard CENS/TS 15083-1 2005:
 - 1. Thermally treated Red Oak: Class 1 (minimum 25 years and over).
- F. Chemical Agents: No chemicals may be used in the treatment process.
- G. Temperature Treatment: Peak temperature of not less than 410 degrees F (210 C).

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation of exterior woodwork only when existing and forecasted weather conditions permit work to be performed.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and

coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, reinforcements, and other related units of Work specified in other Sections to ensure that exterior architectural woodwork can be supported and installed as indicated.

1.9 MOCKUPS

- A. Mockups: Before production of seatwalls, construct full-sized mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build a mockup of each type of unique item as indicated on Drawings, complete with framing, anchors, and unique edge conditions.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
- B. Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Landscape Architect in writing.

1.10 WARRANTY

- A. Special Warranty for seats and decking: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace seats and decking that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, deformation or deterioration beyond normal weathering.
 - 1. Warranty Period for seats and decking (Excluding Finish): **5** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

2.2 WOODWORK FABRICATORS

- A. Fabricators: Subject to compliance with requirements, fabricators offering exterior architectural woodwork that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Fuller Architectural Hardwoods, 14113 West Main St, Daleville, IN 47334, Telephone: (317) 671-7877.
 - 2. Approved Equal.

2.3 EXTERIOR LUMBER

- A. Boards for Benches, Screen Wall, and Swing and Pavilion louvers: Thickness as indicated on the drawings, radius-edged, S4S boards.
 - 1. Species: Thermally Modified Red Oak or Thermally Modified Ash.
 - 2. Description: Wood is factory-treated in a computer controlled, high-temperature kiln without the use of chemicals. Heat and steam provide the materials with a higher dimensional stability and lower equilibrium moisture content compared to untreated hardwood cladding. The process darkens the wood, enhancing the color and grain.
 - 3. Finish: Driftwood Gray, 2 Coats and 80 grit prep
 - 4. Process: Heat modified wood material. Molecular changed wood species through removal of 95% of the Polysaccharides.
 - 5. Grade Characteristics:
 - a. Clear.
 - b. Straight grained and parallel cut.
 - c. Free of heart centers.
 - d. No decay, incipient decay, honeycomb, knot holes, shakes, splits, or wane.
 - e. No discoloration.
 - 6. Moisture Content: 4.5 to 7.5 percent.

2.4 MISCELLANEOUS PRODUCTS

- A. 2-coat finish as supplied by the following manufacturer:
 - 1. Flood Pro Series Semi-Transparent Acrylist/ Oil Stain
 - a. Base: Neutral
 - b. Stain Color: Driftwood Gray

2.5 INSTALLATION MATERIALS

- A. Blocking, Shims, and Nailers: Softwood or hardwood lumber, pressure-preservative treated, kiln dried to less than 15 percent moisture content.
- A. Provide fasteners of size and type indicated, acceptable to the Landscape Architect, and that comply with requirements specified in this article for material and manufacture. Provide screws, in sufficient length, to penetrate not less than 1-1/2 inches into material substrate.
 - 1. Use countersunk stainless steel screws unless otherwise indicated.
 - a. Screws shall sit flush with boards. Install per manufacturer's recommendations.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts, unless otherwise indicated. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.6 FABRICATION, GENERAL

- A. Maximum Wood Moisture Content: Between 4.5 and 7.5 percent upon delivery to the project site.

- B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
- C. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Shop cut openings, to maximum extent possible, to receive hardware, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and seal with a water-resistant coating suitable for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- C. Deliver anchoring devices to be built into substrates well in advance of time substrates are to be built.
- D. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store product in manufacturer's original packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Handle material to avoid damage.
- C. Protect finish carpentry during transit, delivery, storage, and handing to prevent damage, soiling, warping, and deterioration. Wood shall be delivered on a tarped flatbed truck or an enclosed van for small quantities. Keep wood tarped or stored indoors until ready for installation.

- D. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- E. Do not deliver finish carpentry to Project Site until painting, wet work, grinding, and similar operations which could damage, soil, or deteriorate woodwork have been completed in installation areas. If finish carpentry must be stored in areas other than the installation area, store only in areas meeting requirements specified for installation areas.

3.4 INSTALLATION

- A. Quality Standard: Install woodwork to comply with same grade specified in Part 2 for type of woodwork involved.
- B. Install woodwork plumb, level, true and straight with no distortions. Shim as required using concealed shims.
 - 1. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk fasteners.
- E. Complete finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail and screw holes with matching filler where exposed.

3.5 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; replace woodwork where not possible to repair. Adjust joinery for uniform appearance.
- B. Installer of finish carpentry shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at the time of acceptance.
- C. Clean woodwork on exposed and semi-exposed surfaces.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Exterior Architectural Woodwork, including all excavation, lumber, concrete, steel, fabrication, fasteners, stains, incidental materials, and work necessary for a complete installation, as a part of other pay items, will not be measured for payment.
- 4.2 Screen Wall will be measured for payment per Lump Sum.
- 4.3 All excavation, concrete, fabrication, fasteners, stains, incidental materials, and work necessary for a complete installation of Screen Wall will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Exterior Finish Carpentry, including all excavation, lumber, concrete, steel, fabrication, fasteners, stains, incidental material, and work necessary for a complete installation, as a part of other pay items, shall be included in the cost of those respective pay items of which they are a part of.
- 5.2 The cost of Screen Wall shall be paid for at the unit price per Lump Sum.
- 5.3 All excavation, lumber, concrete, fabrication, fasteners, stains, incidental materials, and work necessary for a complete installation of Screen Wall shall be included in the cost of Screen Wall.
- 5.4 Payment will be made under:
 - A.

<u>Pay Item</u>	<u>Pay Unit</u>
Screen Wall	LUMP SUM
- 5.5 This price and payment will be full compensation for furnishing the pay item noted above.

END OF SECTION 064013

SECTION 07 9200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Urethane joint sealants.
- B. Related Requirements:
 - 1. Section 04 4200 "Site Masonry" for sealing joints in stone masonry.
 - 2. Section 32 1373 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

- C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
 - 1. Joint-sealant location and designation.
 - 2. Manufacturer and product name.
 - 3. Type of substrate material.
 - 4. Proposed test.
 - 5. Number of samples required.
 - D. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
 - E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
 - F. Field-Adhesion-Test Reports: For each sealant application tested.
 - G. Sample Warranties: For special warranties.
- 1.6 QUALITY ASSURANCE
- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
 - B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.
 - C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- 1.7 PRECONSTRUCTION TESTING
- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 - 3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with stone substrates.
 - 4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.

5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
 7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 2. Conduct field tests for each kind of sealant and joint substrate.
 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.8 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - a. Sika Corporation; Joint Sealants; Sikaflex 15LM.

2.3 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - a. Alcot Plastics Ltd.; ALCOT Standard Backer Rod.
 - b. BASF Corporation; MasterSeal 920 & 921(Pre-2014: Sonolastic Backer Rod).

c. Construction Foam Products; a division of Nomaco, Inc.; HBR®.

- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

- a. Concrete.
 - b. Masonry.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.
 - a. Use masking tape to protect surfaces adjacent to tooled joints.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints in stone blocks.
 - c. All vertical joints.
 - d. Joints between different materials listed above.
 - e. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Urethane, S, NS, 100/50, T, NT: Single-component, nonsag.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Joint Sealants, including all sealants, backing materials, accessories, labor, and incidental materials will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Joint Sealants, including all sealants, backing materials, accessories, labor, and incidental materials shall be included in the cost of the pay item of which they are a part of.

END OF SECTION 07 9200

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:
 - 1. Exterior Substrates:
 - a. Steel.
- B. Related Requirements:
 - 1. Structural Notes drawings for shop priming of structural steel with primers specified in this Section.
 - 2. Section 09 9600 "Structural Steel Framing"
 - 3. Section 05 7000 "Decorative Metal"
 - 4. Section 32 3300 "Site Furnishings"

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

- A. Master Painters Institute (MPI) Standards:
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and coating systems indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 HIGH-PERFORMANCE COATINGS, GENERAL

- A. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
 - 3. Products shall be of same manufacturer for each coat in a coating system.
- B. Colors: As selected by Architect from manufacturer's full range.

2.2 MATERIALS

- A. This special finish shall be applied in a shop controlled environment to the greatest extent possible. All exposed, finish steel shall be painted, or powdercoated at contractor's option. All structural steel frameworks shall be galvanized.
- B. Products:
 - 1. Basis of Design Products: The design for product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by an approved manufacturer.

2. Basecoat: 90 – 97 Tneme-Zinc, Aromatic Urethane, zinc-rich, by Tnemec Company, Inc. Apply basecoat to a 2-1/2 / 3 mil dry film thickness.
3. Intermediate and Finish Coats: Series 1077 Enduralume Aliphatic Acrylic Polyurethane by Tnemec Company, Inc. Apply to a 2-3 mil dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.
- B. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- C. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 1. Use applicators and techniques suited for coating and substrate indicated.
 2. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 3. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

PART 4 - METHOD OF MEASUREMENT

- 4.1 High Performance Coatings, including all preparation, cleaning, materials, accessories, labor, and incidental materials will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of High Performance Coatings, including all preparation, cleaning, materials, accessories, labor, and incidental materials shall be included in the cost of the pay item of which they are a part of.

END OF SECTION 099600

SECTION 10 1426 - POST AND PANEL/PYLON SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Nonilluminated post-and-panel signs.
- B. Related Requirements:
 - 1. 2022 Indiana Department of Transportation Standard Specifications Section 802.
 - 2. Section 01 5000 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary informational and directional signs.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For signage.
 - 1. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 2. Show message list, typestyles, graphic elements, and layout for each sign at least quarter size.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of products.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1 <Insert requirement>.

2.2 POST-AND-PANEL SIGNS

- A. Post-and-Panel Sign: Sign of single-panel configuration; with smooth, uniform surfaces and support assembly; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 1. Solid-Sheet Sign Panels: Aluminum sheet with finish specified in "Sign-Panel-Face Finish and Applied Graphics" Subparagraph and as follows:
 - a. Thickness: 0.125 inch.
 - b. Surface-Applied Graphics: Applied baked enamel or powder coat.
 2. Posts: Steel.
 - a. Shape: Rectangular.
 - b. Size: 1-3/4 by 3 inches.
 - c. Installation Method: Direct burial.
 - d. Finish and Color: Mill.
 3. Sign-Panel-Face Finish and Applied Graphics:
 - a. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color as indicated by manufacturer's designation.
 4. Text and Typeface: typeface as indicated by manufacturer's designation.

2.3 MATERIALS

- A. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Steel Materials:
 1. Steel Sheet: electrolytic zinc-coated, ASTM A879/A879M, Coating Designation 08Z, with steel sheet substrate according to ASTM A1008/A1008M, commercial steel, exposed.
 2. Steel Members Fabricated from Plate or Bar Stock: ASTM A529/A529M or ASTM A572/A572M, 42,000-psi minimum yield strength.
 3. Bolts for Steel Framing: ASTM A307 or ASTM F3125/F3125M, Grade A325 as necessary for design loads and connection details.
 4. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish nonferrous-metal or hot-dip galvanized devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant, Allen-head slots unless otherwise indicated.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in locations concealed from view after final assembly.
 - 2. Mill joints to tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
 - 4. Conceal fasteners and anchors unless indicated to be exposed; locate exposed fasteners where they will be inconspicuous.
 - 5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
- B. Sign Message Panels: Construct sign-panel surfaces to be smooth and to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.
 - 1. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.
- C. Post Fabrication: Fabricate posts designed for structural performance indicated and of lengths required for installation method indicated for each sign.
 - 1. Steel Posts: Fabricate from minimum 0.120-inch- thick, steel plate unless otherwise indicated. Include post caps, fillers, spacers, junction boxes, access panels, reinforcement where required for loading conditions, and related accessories required for complete installation.
 - a. Hot-dip galvanize post assemblies after fabrication according to ASTM A123/A123M.

2. Direct Burial: Fabricate posts 36 inches longer than height of sign to permit direct burial or embedment in concrete foundations or concrete-filled postholes.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using installation methods indicated and according to manufacturer's written instructions.
 1. Install signs level, plumb, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 3. Before installation, verify that sign components are clean and free of materials or debris that would impair installation.

3.3 INSTALLING POSTS

- A. Vertical Tolerance: Set posts plumb within a tolerance of 1/16 inch in 3 feet.
- B. Direct-Burial Method:
 1. Excavation: Excavate posthole to dimensions indicated. Reconstruct subgrade that is not firm, undisturbed, or compacted soil, or that is damaged by freezing temperatures, frost, rain, accumulated water, or construction activities by excavating an additional 12 inches, backfilling with satisfactory soil or well-graded aggregate, and compacting to original subgrade elevation.

2. Setting in Earth: Set post in position, support to prevent movement, and backfill with satisfactory soil or well-graded aggregate as recommended in writing by manufacturer. Place and compact backfill in 6-inch lifts, compacting each lift.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Sign Post, Square, Type 2, Unreinforced Anchor Base: Includes excavation, backfill and post installation complete.
- 4.2 Sign, Post Assembly: Includes complete installation of sign post assembly including finishes, anchors and fasteners.
- 4.3 Sign, Sheet, with Legend, 0.080-inch Thickness: Includes complete installation of sign including finishes, anchors and fasteners.
- 4.4 Sign, Double Faced, Sheet with Legend, 0.100-inch Thickness: Includes complete installation of sign including finishes, anchors and fasteners.
- 4.5 Sign Sheet, with Legend, 0.100-inch Thickness: Includes complete installation of sign including finishes, anchors and fasteners.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Sign Post, Square, Type 2, Unreinforced Anchor Base shall be paid for at the contract unit price per Linear Foot.
- 5.2 The cost of Sign Post Assembly shall be paid for at the contract unit price per Each.
- 5.3 The cost of Sign, Sheet, with Legend, 0.080-inch Thickness shall be paid for at the contract unit price per Square Foot.
- 5.4 The cost of Sign, Double Faced, Sheet with Legend, 0.100-inch Thickness shall be paid for at the contract unit price per Square Foot.
- 5.5 The cost of Sign Sheet, with Legend, 0.100-inch Thickness shall be paid for at the contract unit price per Square Foot.

END OF SECTION 10 1426

SECTION 11 6800 - PLAY FIELD EQUIPMENT AND STRUCTURES

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 playground equipment as follows:
 - 1. Freestanding playground equipment.
- B. Refer to Section 03 3000 "Cast-in-Place Concrete" for footing requirements.

1.3 DEFINITIONS

- A. Definitions in ASTM F 1487 apply to Work of this Section.
- B. IPEMA: International Play Equipment Manufacturers Association.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of playground equipment.
- C. Field quality-control reports.
- D. Sample Warranty: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground equipment and finishes to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and has demonstrated experience in the successful installation of similar playground equipment.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Manufacturer's standard warranty period but not less than two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain playground equipment from single source from single manufacturer.
- B. Playground equipment and components shall have the IPEMA Certification Seal.
- C. The following playground equipment and components shall have the IPEMA Certification Seal:
 - 1. Log Scramble

2.2 CAST-IN-PLACE CONCRETE

- A. General: Contractor is responsible for providing and installing concrete footings for all play equipment as shown in the plans and Summary specification. Contact for manufacturers is listed adjacent to piece of equipment.
- B. Concrete Materials and Properties: Comply with requirements in Section 03 3000 "Cast-in-Place Concrete" for normal-weight concrete with minimum 28-day compressive strength of 4000 psi, 4 inch slump, and 1-inch-maximum-size aggregate.
- C. Top of footing depths per manufacturer's recommendations, but at a minimum should accommodate surfacing cross section to sit on top as shown in details. Overall footing depth per manufacturer's specifications, but not less than the depth from finished grade to top of footing minus 2'-6", should that be the recommendation. Additional depth is acceptable, but Contractor will not be compensated for additional concrete outside of requirements outlined above.

2.3 FREESTANDING PLAYGROUND EQUIPMENT

- A. Log Scramble.
 - 1. [Columbia Cascade Company, 1300 S.W. Sixth Avenue, Suite 310, Portland, OR 97201, 503-223-1157](http://www.columbiacascade.com)
 - 2. Model: Classic Timberform, Log Scramble, Model No. 4500-303
 - 3. Footing Type: Concrete.
 - 4. Orientation: As Indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work.
 - 1. Do not begin installation before final grading required for placing playground equipment and protective surfacing is completed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions for each equipment type unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.
 - 1. Maximum Equipment Height: Coordinate installed fall heights of equipment with finished elevations and critical-height values of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.
- B. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.
- C. Post Set with Concrete Footing: Comply with Section 03 3000 "Cast-in-Place Concrete" for measuring, batching, mixing, transporting, forming, and placing concrete.
 - 1. Set equipment posts in concrete footing. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.
 - a. Place concrete around posts and vibrate or tamp for consolidation. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
 - 2. Embedded Items: Follow equipment manufacturer's written instructions and drawings to ensure correct installation of anchorages for equipment.
 - 3. Finishing Footings: Smooth top, and shape to shed water.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections.
 - 1. Perform inspection and testing for each type of installed playground equipment according to ASTM F 1487.
- C. Playground equipment items will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

- E. Notify Architect 48 hours in advance of date(s) and time(s) of testing and inspection.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Log Scramble will be measured at the unit price per Lump Sum.
- 4.2 All excavation, backfill, aggregate, concrete footings and foundations, bolts, brackets, plates, incidental materials, and work necessary for a complete installation of Log Scramble will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Log Scramble shall be paid for at the unit price per Lump Sum.
- 5.2 The cost of all excavation, backfill, aggregate, concrete footings and foundations, bolts, brackets, plates, incidental materials, and work necessary for a complete installation of Log Scramble shall be included in the cost Log Scramble.
- 5.3 Payment will be made under:

A. <u>Pay Item</u>	<u>Pay Unit</u>
Log Scramble	LUMP SUM

- 5.4 This price and payment will be full compensation for furnishing all pay items noted above.

END OF SECTION 11 6800

SECTION 26 0000 – ELECTRICAL SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.
 - 2. Use of premises.
 - 3. Specification formats and conventions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: BHRU Infrastructure & Site Engineering, Phase 1.
 - 1. Project Location: Bloomington, IN.
- B. Owner: City of Bloomington.
- C. Landscape Architect: Rundell Ernstberger Associates.
- D. Civil Engineer: Shrewsbury
- E. The Work consists of the following:
 - 1. The Work includes Electrical systems inside the building and outside the building as indicated on the drawings.
- F. Project will be constructed under a single prime contract. See Parts 4 and 5 below for clarification of requirements.

1.3 USE OF PREMISES

- A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.4 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 33-division format and CSI/CSC's "MasterFormat" numbering system.
 - 1. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

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1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - METHOD OF MEASUREMENT

- 4.1 Electrical, System will be measured at the unit price per lump sum.
- 4.2 All necessary permits and fees, excavation, backfill, concrete, and all other incidental materials will not be measured for payment.
- 4.3 All necessary conductors, cables, grounding, bonding, raceways, underground ducts, identification, poles, luminaires, and all other incidental materials necessary for a complete installation will not be measured for payment.
- 4.4 All necessary raceways, boxes, identification, cabinet enclosure, camera mounts, and all other incidental materials necessary for a complete installation for security infrastructure will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Electrical, System shall be paid for at the unit price per lump sum for the complete system tested in place.
- 5.2 The cost of all necessary permits and fees, excavation, backfill, concrete, and all other incidental materials shall be included in the cost of Electrical, System.
- 5.3 The cost of all necessary conductors, cables, grounding, bonding, raceways, underground ducts, identification, poles, luminaires, and all other incidental materials necessary for a complete installation shall be included in the cost of Electrical, System.
- 5.4 All necessary raceways, boxes, identification, cabinet enclosure, camera mounts, and all other incidental materials necessary for a complete installation for security infrastructure will not be measured for payment.

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5.5 Payment will be made under:

A.	<u>Pay Item</u>	<u>Pay Unit</u>
B.	Electrical, System	LUMP SUM

5.6 This price and payment will be full compensation for furnishing the pay item noted above. The cost of all incidental materials and work required for a complete system tested in place shall be included in the cost of the pay item.

END OF SECTION 26 0000

SECTION 26 0031 – ELECTRICAL CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. See Divisions 02 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.2 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
 - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
 - 7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

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. 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.
- B. 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 Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.4 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials 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.

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. Temporary Support: Provide temporary support of Work to be cut.
- B. 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.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

- B. 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.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.

- 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. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

- D. 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.
 - 1. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 2. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

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

PART 4 - METHOD OF MEASUREMENT

- 4.1 Electrical Cutting and Patching, including all accessories and incidentals necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Electrical Cutting and Patching, including all accessories and incidentals necessary for a complete installation, shall be included in the cost of the pay item of which they are a part of

END OF SECTION 26 0031

SECTION 26 0070 – ELECTRICAL CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. See Division 01 for submitting Record Drawings, Record Specifications, and Record Product Data.
- C. See Division 01 for operation and maintenance manual requirements.
- D. See Division 01 for requirements for instructing Owner's personnel.
- E. See Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test/adjust/balance records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

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11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
- 1.
 2. Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

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

1.5 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Remove tools, construction equipment, machinery, and surplus material from Project site.

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- b. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - c. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - d. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - e. Remove labels that are not permanent.
 - f. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - g. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - h. Replace parts subject to unusual operating conditions.
 - i. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - j. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - k. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - l. Leave Project clean and ready for occupancy.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Electrical Closeout Procedures, including all accessories and incidentals necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Electrical Closeout Procedures, including all accessories and incidentals necessary for a complete installation, shall be included in the cost of the pay item of which they are a part of

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END OF SECTION 26 0070

SECTION 26 0090 – ELECTRICAL EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Excavating and backfilling for utility trenches.

1.2 DEFINITIONS

- A. Backfill: Soil 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 off-site for use as fill or backfill.
- D. 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 changes in the Work.
 - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- E. 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.
- F. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: 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 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM 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. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. 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.

2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 2 Section "Site Clearing," during earthwork operations.

3.2 EXCAVATION

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- 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.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course.

3.4 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.5 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.6 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 with satisfactory soil.
- D. Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- 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.
 - 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.
- F. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.7 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.8 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 - 1. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.9 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.

3.10 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.
- D. When testing agency reports that 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.

3.11 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.12 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Electrical Earthwork, including all accessories and incidentals necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Electrical Earthwork, including all accessories and incidentals necessary for a complete installation, shall be included in the cost of the pay item of which they are a part of

A.

END OF SECTION 26 0090

SECTION 26 0519 - 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.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: Indicate type, use, location, and termination locations.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Alpha Wire; brand of Belden, Inc.
 2. Belden Inc.
 3. Cerro Wire LLC.
 4. Encore Wire Corporation.
 5. General Cable; Prysmian Group North America.
 6. Okonite Company (The).
 7. Service Wire Co.
 8. Southwire Company, LLC.
 9. WESCO.
- 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 or ASTM B496 for stranded conductors.
- E. Conductor Insulation:
1. Type THHN and Type THWN-2: Comply with UL 83.

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. 3M Electrical Products.
 2. ABB, Electrification Business.
 3. AFC Cable Systems; Atkore International.
 4. Gardner Bender.
 5. Hubbell Utility Solutions; Hubbell Incorporated.
 6. ILSCO.
 7. Ideal Industries, Inc.
 8. NSi Industries LLC.
 9. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 10. Service Wire Co.
 11. TE Connectivity Ltd.
- 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 or Two hole with standard or long barrels.
 3. Termination: Compression or Crimp.

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. 12 AWG and smaller; stranded for No. 10 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- D. Exposed Branch Circuits: Type THHN/THWN-2, single conductors in raceway.
- E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS

- A. Complete raceway installation between conductor and cable termination points according to Section 26 0533 "Raceways and Boxes 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 0529 "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.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch (150 mm) of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 0553 "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.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Low-Voltage Electrical Power Conductors and Cables, including all accessories and incidentals necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Low-Voltage Electrical Power Conductors and Cables, including all accessories and incidentals necessary for a complete installation, shall be included in the cost of the pay item of which they are a part of.

END OF SECTION 26 0519

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Grounding and bonding conductors.
 2. Grounding and bonding clamps.
 3. Grounding and bonding bushings.
 4. Grounding and bonding hubs.
 5. Grounding and bonding connectors.
 6. Grounding (earthing) electrodes.

1.2 ACTION SUBMITTALS

- A. Product Data:
1. For each type of product indicated.
- B. Shop Drawings: Plans showing dimensioned locations of grounding features described in "Field Quality Control" Article, including the following:
1. Rod electrodes.
- C. 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 or THWN-2, copper or tinned-copper wire or cable, green color, in accordance with Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."
- B. ASTM - Bare Copper Grounding and Bonding Conductor:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ERICO; brand of nVent Electrical plc.
 - b. Harger Lightning & Grounding; business of Harger, Inc.
 2. Referenced Standards: Complying with one or more of the following:
 - a. Soft or Annealed Copper Wire: ASTM B3
 - b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
 - c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.

- d. 19-Wire Combination Unilay-Stranded Copper Conductor:
ASTM B787/B787M.

2.2 GROUNDING AND BONDING CLAMPS

- A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications; see Section 27 0526 "Grounding and Bonding for Communications Systems," for selection and installation guidelines.
- B. 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.

2.3 GROUNDING AND BONDING BUSHINGS

- A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.
- B. 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.

2.4 GROUNDING AND BONDING HUBS

- A. Description: Hubs with certified grounding or bonding locknut.
- B. 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.

2.5 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.

2.6 GROUNDING (EARTHING) ELECTRODES

- A. Description: Grounding electrodes include rod electrodes, ring electrodes, metal underground water pipes, metal building frames, concrete-encased electrodes, and pipe and plate electrodes.
- B. 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.
- C. UL KDER - Rod Electrode:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated.
 - c. ERICO; brand of nVent Electrical plc.
 - d. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - e. Harger Lightning & Grounding; business of Harger, Inc.
 - f. allG Fabrication (formerly ALT).
 - 2. General Characteristics: Copper-clad or Zinc-coated steel; 3/4 inch by 10 ft (19 mm by 3 m).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.

- B. Inspect test results of grounding system measured at point of electrical service equipment connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF GROUNDING AND BONDING 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 (6 mm) 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 (41 mm) wide and 1/16 inch (1.6 mm) thick.
- F. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch (41 mm) wide and 1/16 inch (1.6 mm) thick.
- G. Underground Grounding Conductors: Install bare or tinned-copper conductor, 2/0 AWG minimum.
 - 1. Bury at least 30 inch (750 mm) below grade.

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.

3.4 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
 - 1. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode.

- Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
2. Consult Architect for resolution of conflicting requirements.

C. 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. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
 - d. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1) Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate adjacent parts.
 - 2) Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3) Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.
3. Electrodes:
 - a. Ground Rods: Drive rods until tops are 2 inch (50 mm) below finished floor or final grade unless otherwise indicated.
 - 1) Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2) Use exothermic welds for below-grade connections.
 - b. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode conductor.
 - c. Concrete-Encased Electrode (Ufer Ground):
 - 1) Fabricate in accordance with NFPA 70; use minimum of 20 ft (6 m) of bare copper conductor not smaller than 4 AWG.
 - a) If concrete foundation is less than 20 ft (6 m) long, coil excess conductor within base of foundation.
 - b) Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
 - 2) Fabricate in accordance with NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 ft (6.0 m) long. If reinforcing is in multiple pieces, connect together by usual steel tie wires or exothermic welding to create required length.
4. Grounding at Service:

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- a. Equipment grounding conductors and grounding electrode conductors must be connected to ground bus. Install main bonding jumper between neutral and ground buses.
5. Equipment Grounding:
 - a. Install insulated equipment grounding conductors with feeders and branch circuits.
 - b. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1) Feeders and branch circuits.
 - 2) Lighting circuits.
 - 3) Receptacle circuits.
 - 4) Single-phase motor and appliance branch circuits.
 - 5) Three-phase motor and appliance branch circuits.

3.5 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by Owner.
- 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.
 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to record of tests and observations. Include number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- 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:

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- a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 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.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Grounding and Bonding for Electrical Systems, including all accessories and incidentals necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Grounding and Bonding for Electrical Systems, including all accessories and incidentals necessary for a complete installation, shall be included in the cost of the pay item of which they are a part of.

END OF SECTION 26 0526

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch (10 mm) diameter holes at a maximum of 8 inch (200 mm) on center in at least one surface.

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

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- a. ABB, Electrification Business.
 - b. Allied Tube & Conduit; Atkore International.
 - c. CADDY; brand of nVent Electrical plc.
 - d. Cooper B-line; brand of Eaton, Electrical Sector.
 - e. Flex-Strut Inc.
 - f. G-Strut.
 - g. Gripple Inc.
 - h. Haydon Corporation.
 - i. MIRO Industries.
 - j. Metal Ties Innovation.
 - k. Rocket Rack; Robroy Industries.
 - l. Unistrut; Atkore International.
 - m. Wesanco, Inc.
2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 3. Material for Channel, Fittings, and Accessories: Galvanized steel.
 4. Channel Width: Selected for applicable load criteria.
 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, 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) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.

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2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless 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.
 - 5) MKT Fastening, LLC.
3. 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.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).
6. Toggle Bolts: Stainless steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

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
 2. NECA NEIS 102.
 3. NECA NEIS 105.
 4. NECA NEIS 111.
- B. Comply with requirements for raceways and boxes specified in Section 26 0533 "Raceway and Boxes for Electrical Systems."

3.2 INSTALLATION OF SUPPORTS

- A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.
- B. 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 (90 kg).

- C. 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 New Concrete: Bolt to concrete inserts.
 - 2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 3. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inch (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inch (100 mm) thick.
- D. 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. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Hangers and Supports for Electrical Systems, including all accessories and incidentals necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Hangers and Supports for Electrical Systems, including all accessories and incidentals necessary for a complete installation, shall be included in the cost of the pay item of which they are a part of.

END OF SECTION 26 0529

SECTION 26 0533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type LFMC raceways.
2. Type PVC raceways and fittings.
3. Fittings for conduit.
4. Solvent cements.
5. Nonmetallic outlet boxes, device boxes, rings, and covers.
6. Termination boxes.
7. Cabinets, cutout boxes, junction boxes, and pull boxes.
8. Cover plates for device boxes.
9. Hoods for outlet boxes.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Cabinets and cutout boxes.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details. Show that floor boxes are located to avoid interferences and are structurally allowable. Indicate floor thickness where boxes are embedded in concrete floors and underfloor clearances where boxes are installed in raised floors.

PART 2 - PRODUCTS

2.1 TYPE LFMC 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 360 and UL Category Control Number DXHR.

B. Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. Material: Steel.
2. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - b. Colors: As indicated on Drawings.

2.2 TYPE PVC RACEWAYS AND FITTINGS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 651 and UL Category Control Number DZYR.
- B. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:
 - 1.
 - 2. Dimensional Specifications: Schedule 40.
 - 3. Options:
 - a. Minimum Trade Size: Metric designator 21 (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.
 - 2. Dimensional Specifications: Schedule 80.
 - 3. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - b. Markings: For use with maximum 90 deg C wire.

2.3 FITTINGS FOR CONDUIT

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- B. Fittings for Type PVC Raceways:
 - 1.
 - 2. General Characteristics: UL 514B and UL Category Control Number DWTT.
- C. Fittings for Type LFMC Raceways:
 - 1.
 - 2. General Characteristics: UL 514B and UL Category Control Number DXAS.

2.4 SOLVENT CEMENTS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL Category Control Number DWTT.
 - 3.

2.5 NONMETALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

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 514C and UL Category Control Number QCMZ.

B. Nonmetallic Outlet Boxes:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
- 2.

C. Nonmetallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
- 2.

D. Nonmetallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
- 2.

E. Nonmetallic Concrete Boxes and Covers:

1. Description: Box intended for use in poured concrete.
- 2.

2.6 TERMINATION BOXES

- ### A. Description: Enclosure for termination base consisting of lengths of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors or both.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 1773 and UL Category Control Number XCKT.

C. Termination Boxes and Termination Bases for Installation on Load Side of Service Equipment:

- 1.
2. Additional Characteristics: Listed and labeled for installation on load side of service equipment.

2.7 CABINETS, CUTOOUT BOXES, JUNCTION BOXES, AND PULL BOXES

- 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. Non-Environmental Characteristics: UL 50.
 - b. Environmental Characteristics: UL 50E.
- B. Outdoor Polymeric Junction and Pull Boxes:
 - 1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
 - 2. Additional Characteristics: UL Category Control Number BGUZ.
 - 3. Options:
 - a. Degree of Protection: Type 3R.

2.8 COVER PLATES FOR DEVICES BOXES

- 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. Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
 - b. Wallplate-Securing Screws: Metal with head color to match wallplate finish.
- B. Nonmetallic Cover Plates for Device Boxes:
 - 1.
 - 2. Options:
 - a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
 - b. Wallplate Material: 0.060 inch (1.5 mm) thick high-impact thermoplastic (nylon) with smooth finish and color matching wiring device.
 - c. Color: as selected by the Landscape Architect.

2.9 HOODS FOR OUTLET BOXES

- 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. Reference Standards:
 - 1) UL 514D and UL Category Control Numbers QCIT and QCMZ.
 - 2) Receptacle, hood, cover plate, gaskets, and seals comply with UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.
 - 3. Mounts to box using fasteners different from wiring device.

- B. Extra-Duty, While-in-Use Hoods for Outlet Boxes:
 - 1.
 - 2. Additional Characteristics: Marked "Extra-Duty" in accordance with UL 514D.
 - 3. Options:
 - a. Provides clear, weatherproof, "while-in-use" cover.
 - b. Manufacturer may combine nonmetallic device box with hood as extra-duty rated assembly.

PART 3 - EXECUTION

3.1 SELECTION OF RACEWAYS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult Architect for resolution of conflicting requirements.
- B. Outdoors:
 - 1. Exposed: PVC-80.
 - 2. Concealed Aboveground: PVC-80.
 - 3. Direct Buried: PVC-40.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- C. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

3.2 SELECTION OF BOXES AND ENCLOSURES

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.
- B. Degree of Protection:
 - 1. Outdoors:
 - a. Type 3R unless otherwise indicated.

3.3 INSTALLATION OF RACEWAYS

- A. Installation Standards:
 - 1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult Architect for resolution of conflicting requirements.
 - 2. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
 - 3. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for hangers and supports.
 - 4. Comply with NECA NEIS 111 for installation of nonmetallic raceways.

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5. Install 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.
 6. Raceway Terminations at Locations Subject to Moisture or Vibration:
 - a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG. Install insulated throat metal grounding bushings on service conduits.
- B. General Requirements for Installation of Raceways:
1. Complete raceway installation before starting conductor installation.
 2. 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 (0.6 m) above finished floor.
 3. Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inch (300 mm) of changes in direction.
 4. Make bends in 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.
 5. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
 6. Support conduit within 12 inch (300 mm) of enclosures to which attached.
 7. Install raceway sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings in accordance with NFPA 70.
 8. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
 9. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb (90 kg) tensile strength. Leave at least 12 inch (300 mm) of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- C. Requirements for Installation of Specific Raceway Types:
1. Types LFMC:
 - a. Comply with NEMA RV 3. Provide a maximum of 36 inch (915 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 2. Type PVC:
 - a. Do not install Type PVC conduit where ambient temperature exceeds 122 deg F (50 deg C). 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 written instructions for solvent welding and fittings.
- D. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

3.4 INSTALLATION OF BOXES AND ENCLOSURES

- A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
- B. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- C. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

3.6 CLEANING

- A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Raceway and Boxes for Electrical Systems, including all accessories and incidentals necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Raceway and Boxes for Electrical Systems, including all accessories and incidentals necessary for a complete installation, shall be included in the cost of the pay item of which they are a part of.

END OF SECTION 26 0533

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
 - 2. Labels.
 - 3. Bands and tubes.
 - 4. Tapes and stencils.
 - 5. Signs.
 - 6. Cable ties.
 - 7. Paint for identification.
 - 8. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 - 1. Color shall be factory applied.
 - 2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - 3. Color for Neutral: White.
 - 4. Color for Equipment Grounds: Green.
 - 5. Colors for Isolated Grounds: Green two or more yellow stripes.
- C. Equipment Identification Labels:
 - 1. Black letters on a white field.

2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a 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. emedco.
 - d. Grafoplast Wire Markers.
 - e. HellermannTyton.
 - f. LEM Products Inc.
 - g. Marking Services, Inc.
 - h. Panduit Corp.
 - i. Seton Identification Products; a Brady Corporation company.
- B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter 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.
 - e. Seton Identification Products; a Brady Corporation company.
- C. Self-Adhesive Wraparound Labels: Preprinted or write-on, 3-mil- (0.08-mm-) thick, polyester or vinyl flexible label with acrylic pressure-sensitive adhesive.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A'n D Cable Products.
 - b. Brady Corporation.
 - c. Brother International Corporation.
 - d. emedco.
 - e. Grafoplast Wire Markers.
 - f. Ideal Industries, Inc.
 - g. LEM Products Inc.
 - h. Marking Services, Inc.
 - i. Panduit Corp.
 - j. Seton Identification Products; a Brady Corporation company.
 2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
 3. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 4. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- D. Self-Adhesive Labels: Polyester or vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) 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. A'n D Cable Products.
 - b. Brady Corporation.
 - c. Brother International Corporation.
 - d. emedco.
 - e. Grafoplast Wire Markers.
 - f. HellermannTyton.
 - g. Ideal Industries, Inc.
 - h. LEM Products Inc.
 - i. Marking Services, Inc.

- j. Panduit Corp.
- k. Seton Identification Products; a Brady Corporation company.

2. Minimum Nominal Size:

- a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
- b. 3-1/2 by 5 inches (76 by 127 mm) 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 inches (50 mm) long, with diameters sized to suit diameter 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.

- B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around item being identified. Full shrink recovery occurs at a maximum of 200 deg F (93 deg C). Comply with UL 224.

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

- a. Brady Corporation.
- b. Panduit Corp.

2.5 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

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

- a. Carlton Industries, LP.
- b. Champion America.
- c. HellermannTyton.
- d. Ideal Industries, Inc.
- e. Marking Services, Inc.
- f. Panduit Corp.

- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Marking Services, Inc.
- C. Underground-Line Warning Tape:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Brimar Industries, Inc.
 - c. Ideal Industries, Inc.
 - d. LEM Products Inc.
 - e. Marking Services, Inc.
 - f. Reef Industries, Inc.
 - g. Seton Identification Products; a Brady Corporation company.
 2. Tape:
 - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
 3. Color and Printing:
 - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
 - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

2.6 SIGNS

- A. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Marking Services, Inc.
2. Engraved legend.
3. Thickness:
 - a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
 - b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
 - c. Engraved legend with black letters on white face.
 - d. Self-adhesive.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 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. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 4. Color: Black, except where used for color-coding.
- C. 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 (5 mm).
 2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 4. Color: Black.
- D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.8 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).

PART 3 - EXECUTION

3.1 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. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. 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.
- H. System Identification for Raceways and Cables under 600 V: Identification shall 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.
- I. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

- J. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. "POWER."
- K. Vinyl Wraparound Labels:
 - 1. Secure tight to surface at a location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- L. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
- M. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
- N. Self-Adhesive Labels:
 - 1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
- O. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- P. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- Q. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- R. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
 - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- S. Underground Line Warning Tape:
 - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.
 - 2. Limit use of underground-line warning tape to direct-buried cables.
 - 3. Install underground-line warning tape for direct-buried cables and cables in raceways.

- T. Laminated Acrylic or Melamine Plastic Signs:
 - 1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- U. Cable Ties: General purpose, for attaching tags, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.

3.2 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, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels or vinyl tape applied in bands.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- D. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
 - 1. "POWER."
- E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels, self-adhesive wraparound labels, snap-around labels, snap-around color-coding bands, or self-adhesive vinyl tape to identify the phase.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels with the conductor or cable designation, origin, and destination.

- G. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes or self-adhesive wraparound labels with the conductor designation.
- H. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- I. Equipment Identification Labels:
 - 1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
 - 2. Outdoor Equipment: Laminated acrylic or melamine sign.

PART 4 - METHOD OF MEASUREMENT

4.1 IDENTIFICATION FOR ELECTRICAL SYSTEMS

- A. Including all accessories and incidentals necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

5.1 THE COST OF IDENTIFICATION FOR ELECTRICAL SYSTEMS

- A. Including all accessories and incidentals necessary for a complete installation, shall be included in the cost of the pay item of which they are a part of.

SECTION 26 0923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Electronic time switches.
 2. Outdoor photoelectric switches, solid state, flexible mounting.

1.2 ACTION SUBMITTALS

- A. Product Data:
1. For each type of product.
- B. Shop Drawings:
1. Interconnection diagrams showing field-installed wiring.
 2. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's warranties.

1.4 WARRANTY

- A. Special Extended Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace, including labor, materials, and equipment, devices that fail to perform as specified within extended warranty period.
1. Failures include, but are not limited to, the following:
 - a. Faulty operation of lighting control software.
 - b. Faulty operation of lighting control devices.
 2. Extended Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ELECTRONIC TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
 2. Intermatic, Inc.
 3. Leviton Manufacturing Co., Inc.
 4. NSi Industries LLC.

5. Schneider Electric USA, Inc.
6. TE Connectivity Ltd.
7. Touché Lighting Control.

- B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 2. Contact Configuration: SPST.
 3. Contact Rating: 20 A LED driver load, 120/208 V(ac).
 4. Programs:
 - a. Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays.
 5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
 6. Astronomic Time: All channels.
 7. Automatic daylight savings time changeover.
 8. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES, SOLID STATE, FLEXIBLE MOUNTING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
 2. Intermatic, Inc.
 3. Leviton Manufacturing Co., Inc.
 4. NSi Industries LLC.
 5. TE Connectivity Ltd.
- B. Description: Solid state, with SPST dry contacts rated for 1800 VA LED driver, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A, and compatible with ballasts and LED lamps.
1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
 3. Time Delay: Fifteen-second minimum, to prevent false operation.
 4. Surge Protection: Metal-oxide varistor.
 5. Mounting: Twist lock complies with ANSI C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.
 6. Failure Mode: Luminaire stays ON.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRING

- A. Wiring Method: Comply with Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch (19 mm).
- B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.
- C. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

3.2 IDENTIFICATION

- A. Identify components and power and control wiring in accordance with Section 26 0553 "Identification for Electrical Systems.
- B. Label time switches and contactors with a unique designation.

3.3 MAINTENANCE

- A. Software and Firmware Service Agreement:
 - 1. Technical Support: Beginning at Substantial Completion, verify that software and firmware service agreement includes software support for two years.
 - 2. Upgrade Service: At Substantial Completion, update software and firmware to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Verify upgrading software includes operating system and new or revised licenses for using software.
 - a. Upgrade Notice: No fewer than 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.
 - 3. Upgrade Reports: Prepare written report after each update, documenting upgrades installed.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Lighting Control Devices, including all accessories and incidentals necessary for a complete installation, will not be measured for payment.

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PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Lighting Control Devices, including all accessories and incidentals necessary for a complete installation, shall be included in the cost of the pay item of which they are a part of.

END OF SECTION 26 0923

SECTION 26 2416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Lighting and appliance branch-circuit panelboards.
 - 2. Disconnecting and overcurrent protective devices.

1.2 DEFINITIONS

- A. GFEP: Ground-fault equipment protection.
- B. VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Lighting and appliance branch-circuit panelboards.
 - 2. Disconnecting and overcurrent protective devices.
 - 3. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
 - 4. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details.
 - 2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
 - 3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
 - 4. Detail bus configuration, current, and voltage ratings.
 - 5. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 6. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for series rating of installed devices.
 - 7. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for SPD as installed in panelboard.
 - 8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 9. Include wiring diagrams for power, signal, and control wiring.
 - 10. Key interlock scheme drawing and sequence of operations.
 - 11. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.

Include Internet link for electronic access to downloadable PDF of coordination curves.

1.4 INFORMATIONAL SUBMITTALS

- A. Panelboard Schedules: For installation in panelboards.
- B. Manufacturers' Published Instructions: Record copy of official installation instructions issued to Installer by manufacturer for the following:
 - 1. Recommended procedures for installing panelboards.
 - 2. Recommended torque settings for bolted connections on panelboards.
 - 3. Recommended temperature range for energizing panelboards.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Special Tools: Furnish to Owner proprietary equipment, keys, and software required to operate, maintain, repair, adjust, or implement future changes to panelboards, that are packaged with protective covering for storage on-site and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing agency recognized by authorities having jurisdiction, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.
- D. Enclosures: **Surface-mounted**, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: UL 50E, Type 3R.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims must cover live parts and may have no exposed hardware.
 - 3. Hinged Front Cover: Entire front trim hinged to box. Trims must cover live parts and may have no exposed hardware.
- E. Incoming Mains:
 - 1. Location: Convertible between top and bottom.
- F. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.

- G. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type, with lug on neutral bar for each pole in panelboard.
 - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with lug on bar for each pole in panelboard.
- H. Quality-Control Label: Panelboards or load centers must be labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers must have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- I. Future Devices: Panelboards or load centers must have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- J. Panelboard Short-Circuit Current Rating:
 - 1. Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by qualified electrical testing laboratory recognized by authorities having jurisdiction. Include label or manual with size and type of allowable upstream and branch devices listed and labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for series-connected short-circuit rating.
 - 2. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for 100 percent interrupting capacity.
- K. Surge Suppression: Factory installed as integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB, Electrification Business.
 - 2. Bender Inc.; Bender GmbH & Co. KG.
 - 3. Eaton.
 - 4. Siemens Industry, Inc., Energy Management Division.
 - 5. Square D; Schneider Electric USA.
- B. Listing Criteria: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

- E. Doors: Door-in-door construction with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- 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. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. Electronic Trip Circuit Breakers:
 - a. RMS sensing.
 - b. Field-replaceable rating plug or electronic trip.
 - c. Digital display of settings, trip targets, and indicated metering displays.
 - d. Multi-button keypad to access programmable functions and monitored data.
 - e. Ten-event, trip-history log. Each trip event must be recorded with type, phase, and magnitude of fault that caused trip.
 - f. Integral test jack for connection to portable test set or laptop computer.
 - g. Field-Adjustable Settings:
 - 1) Instantaneous trip.
 - 2) Long- and short-time pickup levels.
 - 3) Long and short time adjustments.
 - 4) Ground-fault pickup level, time delay, and I squared T response.
 - 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 - 5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6 mA trip).
 - 6. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - f. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
 - 1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NECA 407.
 - 2. Consult Landscape Architect for resolution of conflicting requirements.
- C. Special Techniques:
 - 1. Mount panelboard cabinet plumb and rigid without distortion of box.
 - 2. Install overcurrent protective devices and controllers not already factory installed.
 - a. Set field-adjustable, circuit-breaker trip ranges.
 - 3. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
 - 4. Install filler plates in unused spaces.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 0553 "Identification for Electrical Systems."
- B. Panelboard Nameplates: Label each panelboard with nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."
- C. Device Nameplates: Label each branch circuit device in power panelboards with nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."
- D. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles must be located on interior of panelboard door.
- E. Breaker Labels: Faceplate must list current rating, UL and IEC certification standards, and AIC rating.
- F. Circuit Directory:
 - 1. Provide computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
 - a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.

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2. Create directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Panelboards, including all accessories and incidentals necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Panelboards, including all accessories and incidentals necessary for a complete installation, shall be included in the cost of the pay item of which they are a part of.

END OF SECTION 26 2416

SECTION 26 2726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Receptacles with ground-fault protective devices.

1.2 ACTION SUBMITTALS

- A. Product Data:
1. Receptacles with GFCI device.

1.3 INFORMATIONAL SUBMITTALS

- A. Manufacturers' Instructions: Record copy of official installation instructions issued to Installer by manufacturer for the following:
1. Receptacles with GFCI device.
- B. Sample warranties.

PART 2 - PRODUCTS

2.1 RECEPTACLES WITH GROUND-FAULT PROTECTIVE DEVICES

- A. General-Grade, Weather-Resistant, Tamper-Resistant Duplex Straight-Blade Receptacle with GFCI Device:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour; Legrand North America, LLC.
 2. 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.
 3. General Characteristics:
 - a. Reference Standards: UL CCN KCXS, UL 498, and UL 943.
 4. Options:
 - a. Device Color: Gray.
 - b. Configuration: Heavy-duty, NEMA 5-20R.

5. Accessories:
 - a. Cover Plate: 0.060 inch (1.5 mm) thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receptacles:
 1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

- A. Comply with manufacturer's instructions.
- B. Reference Standards:
 1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
 2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
 3. Receptacle Orientation: Unless otherwise indicated in Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
 - a. Hospital-Grade Receptacle Orientation: Orient receptacle with ground pin or neutral pin at top.
 4. Consult Architect for resolution of conflicting requirements.
- C. Identification:
 1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 26 0553 "Identification for Electrical Systems."
 - a. Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.

3.3 PROTECTION

- A. Devices:
 1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.

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2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Wiring Devices, including all accessories and incidentals necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Wiring Devices, including all accessories and incidentals necessary for a complete installation, shall be included in the cost of the pay item of which they are a part of.

END OF SECTION 26 2726

SECTION 26 5619 - LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
 - 2. Luminaire supports.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of luminaire.
- B. Shop Drawings: For nonstandard or custom luminaires.
 - 1. Include plans, elevations, sections, and mounting and attachment details.
 - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
- C. Delegated-Design Submittal: For luminaire supports.
 - 1. Include design calculations for luminaire supports.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale and coordinated.
- B. Retain "Product Certificates" Paragraph below to require submittal of product certificates from manufacturers.

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- C. Product Certificates: For each type of the following:
 - 1. Luminaire.
- D. Sample warranty.

1.5 FIELD CONDITIONS

- A. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. UL Compliance: Comply with UL 1598 and listed for wet location.
- E. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- F. Nominal Operating Voltage: 120 V ac.
- G. In-line Fusing: Separate in-line fuse for each luminaire.
- H. Source Limitations:
 - 1. Obtain luminaires from single source from a single manufacturer.
 - 2. For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 LUMINAIRE TYPES: see drawings.

2.3 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.

- B. Sheet Metal Components: Corrosion-resistant aluminum or Stainless steel. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- D. Diffusers and Globes:
 - 1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
 - 3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- G. Housings:
 - 1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
 - 2. Provide filter/breather for enclosed luminaires.

2.4 FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.

3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.
 - a. Color: as selected by the Landscape Architect.

2.5 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Install lamps in each luminaire.
- D. Fasten luminaire to structural support.
- E. Supports:
 1. Sized and rated for luminaire weight.
 2. Able to maintain luminaire position after cleaning and relamping.
 3. Support luminaires without causing deflection of finished surface.
 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- F. Wiring Method: Install cables in raceways. Conceal raceways and cables.
- G. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.
- H. Coordinate layout and installation of luminaires with other construction.
- I. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

- J. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables" and Section 26 0533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.2 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 26 0533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

PART 4 - METHOD OF MEASUREMENT

- 4.1 LED Exterior Lighting, including all accessories and incidentals necessary for a complete installation, will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of LED Exterior Lighting, including all accessories and incidentals necessary for a complete installation, shall be included in the cost of the pay item of which they are a part of.

END OF SECTION 26 5619

SECTION 31 1000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Incidental site clearing activities not measured or paid for separately.
- B. Related Requirements:
 - 1. Work of this Section shall be in conformance with 2022 Indiana Department of Transportation Standard Specifications Sections 111.
 - 2. Section 01 5723 "Temporary Stormwater Pollution Control" for temporary erosion- and sedimentation-control measures.

1.3 UNIT PRICES

- A. Work of this Section is affected by Unit Prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment".

1.4 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally 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 larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.5 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.

1.7 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Engineer.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- D. Utility Locator Service: Notify Call Before You Dig for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 2000 "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Clearing Right of Way: Includes complete clearing and disposal of debris associated with clearing of areas within project limits as required to facilitate construction in accordance with requirements of INDOT, Section 111 requirements, requirements of this Section and as indicated on Drawings.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Clearing Right of Way shall be paid for at the contract unit price per Lump Sum.

END OF SECTION 31 1000

SECTION 31 2000 - EARTH MOVING

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. Excavating and filling for rough grading the Site.
 - 2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
 - 3. Excavating and backfilling for buildings and structures.
 - 4. Drainage course for concrete slabs-on-grade.
 - 5. Subbase course for concrete walks and pavements.
 - 6. Subbase course and base course for asphalt paving.
 - 7. Subsurface drainage backfill for walls and trenches.
 - 8. Excavating and backfilling trenches for utilities and pits for buried utility structures.
- B. Related Requirements:
 - 1. INDOT and City of Bloomington Standard Specifications
 - a. Where there is a discrepancy between INDOT/City of Bloomington standard specifications and those included herein, the more stringent of the two shall apply.
 - 2. INDOT Standard Specification Section 202 for additional information related to contaminated soils, regulated materials, and rock excavation.
 - 3. Section 03 3300 "Cast-in-Place Concrete" for preparing earth for concrete.
 - 4. Section 31 2550 "Structural Soil" for structural soil requirements.
 - 5. Section 32 1313 "Concrete Paving" for preparing earth for concrete.
 - 6. Section 32 1400 "Unit Paving" for preparing earth for unit pavers.
 - 7. Section 32 1443 "Porous Unit Paving" for preparing earth for porous unit pavers.
 - 8. Section 32 9200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
 - 9. Section 32 9300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
 - D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
 - E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
 - F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. 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.
 - G. Fill: Soil materials used to raise existing grades.
 - H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cubic yard or more in volume that exceed a standard penetration resistance of **100** blows/2 inches when tested by a geotechnical testing agency, according to ASTM D1586.
 - I. 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.
 - J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
 - K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
 - L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.
- 1.4 PREINSTALLATION MEETINGS
- A. Preinstallation Conference: Conduct preexcavation conference at Project Site.
 - 1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
 - a. Personnel and equipment needed to make progress and avoid delays.
 - b. Coordination of Work with utility locator service.

- c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
- d. Extent of trenching by hand or with air spade.
- e. Field quality control.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Geotextiles.
 - 2. Controlled low-strength material, including design mixture.
 - 3. Geofam.
 - 4. Warning tapes.
- B. Samples for Verification: For the following products, in sizes indicated below:
 - 1. Geotextile: 12 by 12 inches.
 - 2. Warning Tape: 12 inches long; of each color.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D2487.
 - 2. Laboratory compaction curve according to ASTM D698.
- C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.
- D. Schedule for Anticipated Rock Removal: Within the initial Contractor's Construction Schedule, the contractor shall provide a schedule, and specific dates, for anticipated rock removal.

1.7 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

1.8 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving 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 Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.

- C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.
- D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 01 5723 "Temporary Storm Water Pollution Control" and Section 31 1000 "Site Clearing" are in place.
- E. Do not commence earth-moving operations until plant-protection measures specified in Section 01 5639 "Temporary Tree and Plant Protection" are in place.
- F. 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 digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.
- J. Compacted Limestone Shoulders: Crushed limestone with dust, referred to locally as 1/4" minus, as supplied by Rogers Group Inc., 1100 N. Oard Road, Bloomington, IN 47404, or approved equal.
- K. Sand: ASTM C33/C33M; fine aggregate.
 - 1. Sand beneath stone shoulders shall be compacted to 95% proctor.
- L. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 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. Survivability: As follows:
 - a. Grab Tensile Strength: 157 lbf; ASTM D4632.
 - b. Sewn Seam Strength: 142 lbf; ASTM D4632.
 - c. Tear Strength: 56 lbf; ASTM D4533.
 - d. Puncture Strength: 56 lbf; ASTM D4833.
 - 3. Apparent Opening Size: No. 40 sieve, maximum; ASTM D4751.
 - 4. Permittivity: 0.5 per second, minimum; ASTM D4491.
 - 5. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.
- 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. Survivability: As follows:
 - a. Grab Tensile Strength: 247 lbf; ASTM D4632.
 - b. Sewn Seam Strength: 222 lbf; ASTM D4632.
 - c. Tear Strength: 90 lbf; ASTM D4533.
 - d. Puncture Strength: 90 lbf; ASTM D4833.

3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.
4. Permittivity: 0.02 per second, minimum; ASTM D4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
 1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. 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.
- D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.
- 3.3 EXPLOSIVES
- A. Explosives: Do not use explosives.
- 3.4 EXCAVATION, GENERAL
- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 2. If unanticipated rock removal is encountered, provide the Owner and Architect a minimum of 48 hours notice prior to completing any rock removal work.
 3. Remove rock to lines and grades 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 inches wide.
- 3.5 EXCAVATION FOR STRUCTURES
- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 - 1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Cut and protect roots according to requirements in Section 01 5639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and 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.
- C. Trench Bottoms Where Bedding Course is Required: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:
 - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 - 3. Cut and protect roots according to requirements in Section 01 5639 "Temporary Tree and Plant Protection."

3.8 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons 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. Limit vehicle speed to 3 mph.

2. 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.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
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, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

- C. Trenches under Footings: Backfill trenches excavated under footings and within **18 inches** of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 03 3000 "Cast-in-Place Concrete."
- D. Trenches under Roadways: Provide 4 inch thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 03 3000 "Cast-in-Place Concrete."
- E. Backfill voids with satisfactory soil while removing shoring and bracing.
- F. Initial Backfill: Structural Backfill: Place Structural Backfill under and up to pipe springline on all installations. If within 5' of pavement edge, continue structural backfill up until no longer in zone which is supporting the pavement (45 degrees downward from edge of pavement.) Soil Backfill can be used above springline outside of 5' pavement. For water mains, the pipe must be fully encompassed with structural backfill including 12" above the pipe.
 - 1. Carefully compact Structural Backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
 - 2. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - 3. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.
- H. Final Backfill:
 - 1. Soil Backfill: Outside of Structural Pavement Zone as stated in Initial Backfill, place and compact final backfill of satisfactory soil to final subgrade elevation.
 - 2. Structural Backfill: Place and compact final backfill to final subgrade elevation.
- I. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 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.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.
 - 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

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.
 - 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 and aggregates to not less than the following percentages of maximum dry unit weight according to ASTM D698:
 - 1. Under structures, building slabs, steps, stone shoulders, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
 - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 - 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 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 Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1 inch.
 - 3. Pavements: Plus or minus 1/2 inch.

3.17 SUBSURFACE DRAINAGE

- A. 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 D698.
- B. 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 one 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 D698.
 - 2. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.

3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 - 1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Place base course material over subbase course under hot-mix asphalt pavement.
 - 3. Shape subbase course and base course to required crown elevations and cross-slope grades.
 - 4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
 - 5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D698

3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Place drainage course 6 inches or less in compacted thickness in a single layer.

3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.20 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- D. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Tests will be performed at the following locations and frequencies:
 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.21 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.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

PART 4 - METHOD OF MEASUREMENT

- 4.1 The cost of Compacted Limestone Shoulders will be measured at the unit price per cubic yard.
- 4.2 The cost of Compacted Sand will be measured at the unit price per cubic yard.
- 4.3 The cost of Contaminated Soils, Stockpile will be measured at the unit price per ton.
- 4.4 The cost of Regulated Materials, Dispose, Type C will be measured at the unit price per ton.
- 4.5 The cost of Regulated Materials, Dispose, Type C will be measured at the unit price per ton.
- 4.6 The cost of Excavation, Rock will be measured at the unit price per cubic yard.
- 4.7 Earth Moving, including all soils, aggregates, geotextiles, accessories, labor, and incidental materials will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Compacted Limestone Shoulders shall be paid for at the unit price per cubic yard.
- 5.2 The cost of Compacted Sand shall be paid for at the unit price per cubic yard.
- 5.3 The cost of Contaminated Soils, Stockpile shall be paid for at the unit price per ton.
- 5.4 The cost of Regulated Materials, Dispose, Type C shall be paid for at the unit price per ton.
- 5.5 The cost of Regulated Materials, Dispose, Type C shall be paid for at the unit price per ton.
- 5.6 The cost of Excavation, Rock shall be paid for at the unit price per cubic yard.
- 5.7 The cost of Earth Moving, including all soils, aggregates, geotextiles, accessories, labor, and incidental materials shall be included in the cost of the pay item of which they are a part of.
- 5.8 Payment will be made under:

A. Pay Item

Pay Unit

Compacted Limestone Shoulder	CUBIC YARDS
Compacted Sand	CUBIC YARDS
Contaminated Soils, Stockpile	TONS
Regulated Materials, Dispose, Type C	TONS
Regulated Materials, Remove, Type C	TONS
Excavation, Rock	CUBIC YARDS

5.9 This price and payment will be full compensation for furnishing all pay items noted above.

END OF SECTION 31 2000

SECTION 32 1216 - 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.
- B. Indiana Department of Transportation (INDOT) Standard Specifications – Section 401.

1.2 SUMMARY

- A. Section Includes:
 - 1. Hot-mix asphalt paving.
 - 2. Hot-mix asphalt overlay.
 - 3. Cold milling of existing asphalt pavement.
 - 4. Hot-mix asphalt patching.
- B. Related Requirements:
 - 1. 2022 Indiana Department of Transportation Standard Specifications, Section 301 and 401.
 - 2. Section 31 1000 "Site Clearing" for demolition and removal of existing asphalt pavement.
 - 3. Section 31 2000 "Earth Moving" for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
 - 4. Section 32 1313 "Concrete Paving" for concrete pavement and for separate concrete curbs, gutters, and driveway aprons.
 - 5. Section 32 1373 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation 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 requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.5 ACTION SUBMITTALS

- A. Product Data: Include technical data and tested physical and performance properties.
 - 1. Herbicide.
 - 2. Paving geotextile.

3. Joint sealant.

B. Hot-Mix Asphalt Designs:

1. Certification, by authorities having jurisdiction, of approval of each hot-mix asphalt design proposed for the Work.
2. For each hot-mix asphalt design proposed for the Work.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For paving-mix manufacturer and testing agency.

B. Material Certificates: Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

1. Aggregates.
2. Asphalt binder.
3. Tack coat.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.

B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Section 401 of INDOT Standard Specifications for asphalt paving work.

1. Measurement and payment provisions shall be in accordance with applicable pay items.

1.8 FIELD 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. Prime Coat: Minimum surface temperature of 60 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Asphalt Base Course and Intermediate Course: Minimum surface temperature of 40 deg F and rising at time of placement.
4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D692/D692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: [ASTM] AASHTO M 320 binder designation PG 64-22.
- B. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- C. Water: Potable.

2.3 AUXILIARY MATERIALS

- A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires asphalt shingles or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.
- B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.
- C. Sand: AASHTO M 29, Grade No. 2 or No. 3.
- D. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes [approved by authorities having jurisdiction] [; designed in accordance with procedures in AI MS-2, "Asphalt Mix Design Methods";] and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Base Course: QC/QA-HMA, 2, 64 base, 25.0 mm.
 - 3. Intermediate Course: QC/QA-HMA 2, 64, intermediate, 19.0 mm .
 - 4. Surface Course: QC/QA-HMA, 1.5, 64, surface, 9.5 mm .

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.
- 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.

2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

3.3 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 of 1-1/2 inches.
 2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
 3. Control rate of milling to prevent tearing of existing asphalt course.
 4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
 5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
 6. Patch surface depressions deeper than 1 inch after milling, before wearing course is laid.
 7. Handle milled asphalt material in accordance with approved waste management plan required in Section 01 7419 "Construction Waste Management and Disposal."
 8. Keep milled pavement surface free of loose material and dust.
 9. Do not allow milled materials to accumulate on-site.

3.4 PATCHING

- A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd..
 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. Placing Single-Course Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.5 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.6 SURFACE PREPARATION

- A. Ensure that prepared subgrade has been proof-rolled and is ready to receive paving. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.
- B. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..
 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.

3.7 INSTALLATION OF PAVING GEOTEXTILE

- A. Apply tack coat uniformly to existing pavement surfaces at a rate of 0.20 to 0.30 gal./sq. yd..
- B. Place paving geotextile promptly in accordance with manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches and transverse joints 6 inches.
- C. Protect paving geotextile from traffic and other damage, and place hot-mix asphalt overlay the same day.

3.8 HOT-MIX ASPHALT PLACEMENT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 1. Place hot-mix asphalt base course and intermediate course in number of lifts and thicknesses indicated.
 2. Place hot-mix asphalt surface course in single lift.
 3. Spread mix at a minimum temperature of 250 deg F.
 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
 2. Complete a section of asphalt base course and intermediate 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.

3.9 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
 - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method in accordance with AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
 - 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.

3.10 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 - 1. Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041/D2041M, but not less than 90 percent or greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. 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.

3.11 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce thickness indicated within the following tolerances:
 - 1. Base Course and Intermediate Course: Plus or minus 1/2 inch.
 - 2. Surface Course: Plus 1/4 inch, no minus.
- B. Pavement Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course and Intermediate Course: 1/4 inch.
 - 2. Surface Course: 1/8 inch.
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined in accordance with ASTM D3549/D3549M.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement in accordance with 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 in accordance with ASTM D2041/D2041M, and compacted in accordance with job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples in accordance with ASTM D1188 or ASTM D2726/D2726M.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than three cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method in accordance with ASTM D2950/D2950M and coordinated with ASTM D1188 or ASTM D2726/D2726M.
- E. Replace and compact hot-mix asphalt where core tests were taken.
- F. 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 WASTE HANDLING

- A. General: Handle asphalt-paving waste in accordance with approved waste management plan required in Section 01 7419 "Construction Waste Management and Disposal."

PART 4 - METHOD OF MEASUREMENT

- 4.1 Subgrade Treatment, Type 1C (Modified) shall be measured at the contract unit price per Square Yard for subgrade treatment completed and accepted in accordance with INDOT Standard Specifications Section 207 Method of Measurement requirements.
- 4.2 Compacted Aggregate No. 8 shall be measured at the contract unit price per Cubic Yard for subbase completed and accepted in accordance with INDOT Standard Specifications Section 301 Method of Measurement and Section 31 2000 "Earth Moving" requirements.
- 4.3 Compacted Aggregate No. 53 shall be measured at the contract unit price per Ton for subbase completed and accepted in accordance with INDOT Standard Specifications Section 301 Method of Measurement and Section 31 2000 "Earth Moving" requirements.
- 4.4 Geogrid – Interax Filtergrid NX750-FG, shall be measured at the contract unit price per Square Yard, completely furnished, installed and accepted, in accordance with INDOT Standard Specifications, Method of Measurement and requirements of this section.
- 4.5 Asphalt Milling, 1.5-inches, shall be measured at the contract unit price per Square Yard in accordance with INDOT Standard Specifications Section 207 Method of Measurement and requirements of this section.
- 4.6 Hot-Mix Asphalt, 2, 64, Surface, 9.5mm shall be measured at the contract unit price per Ton for surface asphalt course in place and accepted in accordance with INDOT Standard Specifications Section 207 Method of Measurement and requirements of this Section.
- 4.7 Hot-Mix Asphalt, 2, 64, Intermediate, 19mm shall be measured at the contract unit price per Ton for intermediate asphalt course completed and accepted in accordance with INDOT Standard Specifications Section 301 Method of Measurement and requirements of this Section.
- 4.8 Hot-Mix Asphalt, 3, 64, Base, 25mm shall be measured at the contract unit price per Ton for base asphalt course completed and accepted in accordance with INDOT Standard Specifications Section 301 Method of Measurement and requirements of this Section.
- 4.9 Additional Asphalt Paving requirements shall be considered incidental and will not be paid for separately.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Subgrade Treatment, Type 1C (Modified) shall be paid for at the contract unit price per Square Yard.
- 5.2 The cost of Compacted Aggregate No. 8 shall be paid for at the contract unit price per Cubic Yard.
- 5.3 The cost of Compacted Aggregate No. 53 shall be paid for at the contract unit price per Ton.
- 5.4 The cost of Geogrid – Interax Filtergrid NX750-FG, shall be paid for at the contract unit price per Square Yard.

- 5.5 The cost of Asphalt Milling 1.5-inch, shall be paid for at the contract unit price per Square Yard.
- 5.6 The cost of Hot-Mix Asphalt, 2, 64, Surface, 9.5mm shall be paid for at the contract unit price per Ton.
- 5.7 The cost of Hot-Mix Asphalt, 2, 64, Intermediate, 19mm shall be paid for at the contract unit price per Ton.
- 5.8 The cost of Hot-Mix Asphalt, 3, 64, Base, 25mm shall be paid for at the contract unit price per Ton.

END OF SECTION 32 1216

SECTION 32 1313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes concrete paving including the following:
 - 1. Subslabs.
 - 2. Curbs and gutters.
 - 3. Walks.

- B. Related Requirements:
 - 1. INDOT and City of Bloomington Standard Specifications
 - a. Where there is a discrepancy between INDOT/City of Bloomington standard specifications and those included herein, the more stringent of the two shall apply.
 - 2. Section 03 3000 "Cast-in-Place Concrete" for general building applications of concrete.
 - 3. Section 32 1373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.
 - 4. Section 32 1400 "Unit Paving."
 - 5. Section 32 1726 "Tactile Warning Surfacing" for detectable warning tiles.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.
 - 1. Review methods and procedures related to concrete paving, including but not limited to, the following:
 - a. Concrete mixture design.
 - b. Quality control of concrete materials and concrete paving construction practices.
 - 2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete paving Subcontractor.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified [Installer of stamped detectable warnings] [ready-mix concrete manufacturer] [and] [testing agency].
- B. Material Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Bonding agent or epoxy adhesive.
 - 8. Joint fillers.
- C. Material Test Reports: For each of the following:
 - 1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").
- B. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests must be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
 - 2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches by 96 inches.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.8 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 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 design mixtures.
- C. Hot-Weather Concrete 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 in 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.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A615/A615M, Grade 60; deformed.
- C. Plain-Steel Wire: ASTM A1064/A1064M, as drawn.
- D. Epoxy-Coated, Joint Dowel Bars: ASTM A775/A775M; with ASTM A615/A615M, Grade 60 plain-steel bars.
- E. Tie Bars: ASTM A615/A615M, Grade 60; deformed.
- F. Hook Bolts: ASTM A307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- H. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

2.4 CONCRETE MATERIALS

- A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
 - 1. Portland Cement: ASTM C150/C150M, gray portland cement Type I.
 - 2. Fly Ash: ASTM C618, Class C.
 - 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
 - 4. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, portland blast-furnace slag cement.
- B. Normal-Weight Aggregates: ASTM C33/C33M, Class 4S, uniformly graded. Provide aggregates from a single source[with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials].
 - 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C260/C260M.
- D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 2. Retarding Admixture: ASTM C494/C494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- E. Water: Potable and complying with ASTM C94/C94M.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, [Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry] [or] [cotton mats].
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ChemMasters, Inc.
 - b. Euclid Chemical Company (The); an RPM company.
 - c. Sika Corporation.
 - d. W. R. Meadows, Inc.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ChemMasters, Inc.
 - b. Euclid Chemical Company (The); an RPM company.
 - c. SpecChem, LLC.
 - d. TK Products Construction Coatings, a Fenix Group SPC Company.
 - e. W. R. Meadows, Inc.

2.6 RELATED MATERIALS

- A. Joint Fillers: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork in preformed strips.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
 - 2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash or Pozzolan: 25 percent.
 - 2. Slag Cement: 50 percent.
 - 3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 - 1. Air Content, 1-1/2-inch Nominal Maximum Aggregate Size: 5-1/2 percent plus or minus 1-1/2-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 high-range, water-reducing 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. Concrete Mixtures: Normal-weight concrete.
 - 1. Compressive Strength (28 Days): 4500 psi.
 - 2. Maximum W/C Ratio at Point of Placement: 0.45
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Furnish batch certificates for each batch discharged and used in the Work.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 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 paving to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 31 2000 "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 INSTALLATION OF STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- 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 edges 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 paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
 - 2. Provide tie bars at sides of paving strips where indicated.
 - 3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. 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.
 - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt 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, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
 - 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. During concrete placement, protect top edge of joint filler 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 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
 - a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 - a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
 3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel 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. Do not add water to fresh concrete after testing.
- F. 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.
- G. 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.
- H. Screed paving surface with a straightedge and strike off.

- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

3.8 INSTALLATION OF DETECTABLE WARNINGS

- A. Blockouts: Form blockouts in concrete for installation of detectable paving units specified in Section 32 1726 "Tactile Warning Surfacing."
 - 1. Tolerance for Opening Size: Plus 1/4 inch, no minus.

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 a combination of these as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.

- c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, 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 occurring during installation or 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.

3.10 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
 1. Elevation: 1/4 inch.
 2. Thickness: Plus 3/8 inch, minus 1/8 inch.
 3. Surface: Gap below 10-foot-long; unlevel straightedge not to exceed 1/2 inch.
 4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
 5. Lateral Alignment and Spacing of Dowels: 1 inch.
 6. Vertical Alignment of Dowels: 1/4 inch.
 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
 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: Engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C172/C172M will be performed according to the following requirements:
 1. Testing Frequency: Obtain at least one composite sample for each 5000 sq. ft. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C231/C231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.

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5. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test to be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results to be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests to 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 will make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.
- 3.12 REPAIR AND PROTECTION
- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
 - B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
 - C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Sidewalk, Concrete will be measured at the unit price per square foot.
- 4.2 Sidewalk, Concrete, Modified will be measured at the unit price per square foot.
- 4.3 Concrete Pavement, 6 inch will be measured at the unit price per square foot.
- 4.4 Concrete Pavement, 8 inch will be measured at the unit price per square foot.
- 4.5 Concrete pavement beneath unit pavers will not be measured for payment.
- 4.6 Curb, Concrete will be measured at the unit price per linear foot.
- 4.7 Curb, Concrete, 8" will be measured at the unit price per linear foot.
- 4.8 Curb, Concrete, Modified will be measured at the unit price per linear foot.
- 4.9 Concrete Containment Curb, 8 inch will be measured at the unit price per linear foot.
- 4.10 Concrete Containment Curb, 12 inch will be measured at the unit price per linear foot.
- 4.11 Concrete Containment Curb, 24 inch will be measured at the unit price per linear foot.
- 4.12 Curb, Concrete, Depressed will be measured at the unit price per linear foot
- 4.13 Curb, Integral Concrete shall be measured at the unit price per lineal foot.
- 4.14 Concrete Entrance shall be measured at the unit price per square yards.
- 4.15 Reinforcing, jointing, joint material, excavation, backfill, finishing, base and subbase meeting the requirements of INDOT Standard Specifications Section 105 and requirements of this section will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Sidewalk, Concrete, shall be paid for at the unit price per square foot.
- 5.2 The cost of Sidewalk, Concrete, Modified shall be paid for at the unit price per square foot.
- 5.3 The cost of Concrete Pavement, 6 inch shall be paid for at the unit price per square foot.
- 5.4 The cost of Concrete Pavement, 8 inch shall be paid for at the unit price per square foot.
- 5.5 The cost of concrete pavement beneath unit pavers shall be included in the cost of unit pavers. Reference Section 32 1400 "Unit Paving."
- 5.6 The cost of Curb, Concrete shall be paid for at the unit price per lineal foot.

- 5.7 The cost of Curb, Concrete, 8” shall be paid for at the unit price per lineal foot.
- 5.8 The cost of Curb, Concrete, Modified shall be paid for at the unit price per lineal foot.
- 5.9 The cost of Concrete Containment Curb, 8 inch shall be paid for at the unit price per lineal foot.
- 5.10 The cost of Concrete Containment Curb, 12 inch shall be paid for at the unit price per lineal foot.
- 5.11 The cost of Concrete Containment Curb, 24 inch shall be paid for at the unit price per lineal foot.
- 5.12 The cost of Curb, Concrete, Depressed shall be paid for at the unit price per lineal foot.
- 5.13 The cost of Curb, Integral Concrete shall be paid for at the unit price per lineal foot.
- 5.14 The cost of Concrete Entrance shall be paid for at the unit price per square yard.
- 5.15 The cost of reinforcing, jointing, joint material, excavation, backfill, finishing, base and subbase meeting the requirements of INDOT Standard Specifications Section 105 and requirements of this section shall be included in the cost of those respective pay items of which they are a part of.

5.16 Payment will be made under:

A.	<u>Pay Item</u>	<u>Pay Unit</u>
	Sidewalk, Concrete	SQUARE FOOT
	Sidewalk, Concrete, Modified	SQUARE FOOT
	Concrete Pavement, 6 inch	SQUARE FOOT
	Concrete Pavement, 8 inch	SQUARE FOOT
	Curb, Concrete	LINEAR FOOT
	Curb, Concrete, 8”	LINEAR FOOT
	Curb, Concrete, Modified	LINEAR FOOT
	Concrete Containment Curb, 8 inch	LINEAR FOOT
	Concrete Containment Curb, 12 inch	LINEAR FOOT
	Concrete Containment Curb, 24 inch	LINEAR FOOT
	Curb, Concrete, Depressed	LINEAR FOOT
	Curb, Integral Concrete	LINEAR FOOT

Concrete Entrance

SQUARE YARD

5.17 This price and payment will be full compensation for furnishing all pay items noted above.

END OF SECTION 32 1313

SECTION 32 13 73 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold-applied joint sealants.
 - 2. Joint-sealant backer materials.
 - 3. Primers.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Paving-Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of joint sealant and accessory.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

- B. Product Testing: Test joint sealants using a qualified testing agency.

1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 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.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.
 - 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. W. R. Meadows, Inc.

2.3 JOINT-SEALANT BACKER MATERIALS

- A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.
- B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.4 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
- 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. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.
- C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of joint-sealant backings.
 - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
 - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
 - 1. Place joint sealants so they fully contact joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form

smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

- A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.
- B. 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 in repaired areas are indistinguishable from the original work.

3.5 PAVING-JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Joints within concrete paving.
1. Joint Location:
 - a. Expansion and isolation joints in concrete paving.
 - b. Contraction joints in concrete paving.
 - c. Other joints as indicated.
 2. Joint Sealant: Single component, pourable, urethane, elastomeric joint sealant.
 3. Joint-Sealant Color: Manufacturer's standard.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Concrete Paving Joint Sealants, including all sealants, backing materials, accessories, labor, and incidental materials will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Concrete Paving Joint Sealants, including all sealants, backing materials, accessories, labor, and incidental materials shall be included in the cost of the pay item of which they are a part of.

END OF SECTION 32 1373

SECTION 32 14 00 - UNIT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Brick pavers set in bituminous setting beds.
 - 2. Asphalt-block pavers set in bituminous setting beds.
 - 3. Aluminum edge restraints.
 - 4. Cast-in-place concrete edge restraints.
- B. Related Requirements:
 - 1. Section 32 13 13 "Concrete Paving" for concrete base under unit pavers and for cast-in-place concrete curbs and gutters serving as edge restraints for unit pavers.
 - 2. Section 32 14 43 "Porous Unit Paving" for unit paving using grid pavers or pavers with openings between them.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For materials other than water and aggregates.
- B. Product Data: For the following:
 - 1. Pavers.
 - 2. Bituminous setting materials.
 - 3. Edge restraints.
- C. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C 136.
- D. Samples for Initial Selection: For each type of unit paver indicated.
- E. Samples for Verification: For full-size units of each type of unit paver indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Adhesion and Compatibility Test Reports: From latex-additive manufacturer for mortar and grout containing latex additives.

- B. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.
 - 1. For solid interlocking paving units, include test data for freezing and thawing according to ASTM C 67.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Pavers: One (1) pallet of each paver type and color.

1.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Initial mockup shall be used to confirm color selection.
 - 2. Each paver type and color shall be represented.
 - 3. Do not order remaining pavers until mockup is approved.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquids in tightly closed containers protected from freezing.
- E. Store asphalt cement and other bituminous materials in tightly closed containers.

1.9 FIELD CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Bituminous Setting Bed:

1. Install bituminous setting bed only when ambient temperature is above 40 deg F and when base is dry.
2. Apply asphalt adhesive only when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately before application. Do not apply when setting bed is wet or contains excess moisture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 BRICK PAVERS

- A. Unit Pavers, Type 1: Light-traffic paving brick; ASTM C 902, Class SX, Type I, Application PS. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.
 1. Provide the following:
 - a. Whitacre-Greer, 1400 South Mahoning Avenue, Alliance, OH 44601.
 - 1) Colors: Pattern as indicated on Drawings.
 - a) Type 2: #44 Mahogany
 - b) Type 3: #30 Clear Rustic Red
 - b. Belden Brick Company, PO Box 20910, Canton, OH 44701
 - 1) Colors: Pattern as indicated on Drawings.
 - a) Type 2: Kodiak Brown
 - b) Type 3: Admiral Red
 2. Thicknesses: 2-1/4 inches.
 3. Face Size: 4 by 8 inches.

2.3 ASPHALT-BLOCK PAVERS

- A. Unit Pavers, Type 2 (12x12 Blank Paver): Solid units made from asphalt cement complying with ASTM D 312, Type III; inorganic stone dust or cement filler; and coarse aggregate, consisting of clean, hard, unweathered stone crushed into angular particles varying in size up to 3/8 inch.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Hanover Architectural Products, 5000 Hanover Road, Hanover, PA 17331.
 - 1) Thickness: 2 3/4 inches.
 - 2) Face Size: 12 by 12 inches nominal (11-3/4 by 11 3/4 inch).
 - 3) Dimensional Tolerances: Plus or minus 1/16 inch.
 - 4) Finish: #28
 - 5) Colors: Pattern as indicated on Drawings.
 - a) Type 5: Charcoal.
- B. Unit Pavers, Type 3 (Directional Warning Paver): Solid units made from asphalt cement complying with ASTM D 312, Type III; inorganic stone dust or cement filler; and coarse

aggregate, consisting of clean, hard, unweathered stone crushed into angular particles varying in size up to 3/8 inch.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Hanover Architectural Products, 5000 Hanover Road, Hanover, PA 17331.
 - 1) Thickness: 2-3/4 inches
 - 2) Face Size: 12 by 12 inches nominal (11-3/4 by 11-3/4 inch).
 - 3) Dimensional Tolerances: Plus or minus 1/16 inch.
 - 4) Finish: #28.
 - 5) Colors: Pattern as indicated on Drawings.
 - 6) Type 5: Charcoal.

2.4 CURBS AND EDGE RESTRAINTS

- A. Aluminum Edge Restraints: Manufacturer's standard 1/4-inch thick by 2-1/2 inch high and wide extruded-aluminum angle with holes drilled to receive anchors at 24 inches o.c.
- B. Job-Built Concrete Edge Restraints: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mixed concrete with minimum 28-day compressive strength of 4500 psi.

2.5 ACCESSORIES

- A. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.

2.6 BITUMINOUS SETTING-BED MATERIALS

- A. Primer for Base: ASTM D 2028/D 2028M, cutback asphalt, grade as recommended by unit paver manufacturer.
- B. Fine Aggregate for Setting Bed: ASTM D 1073, No. 2 or No. 3.
- C. Asphalt Cement: ASTM D 3381/D 3381M, Viscosity Grade AC-10 or Grade AC-20.
- D. Neoprene-Modified Asphalt Adhesive: Paving manufacturer's standard adhesive consisting of oxidized asphalt combined with 2 percent neoprene and 10 percent long-fibered mineral fibers containing no asbestos.
- E. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.
 1. Use polymeric joint sand where indicated on Drawings.

2.7 BITUMINOUS SETTING-BED MIX

- A. Mix bituminous setting-bed materials at an asphalt plant in approximate proportion, by weight, of 7 percent asphalt cement to 93 percent fine aggregate unless otherwise indicated. Heat mixture to 300 deg F.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.
- C. Proof-roll prepared subgrade according to requirements in Section 31 20 00 "Earth Moving" to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for unit pavers.

3.3 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
 - 1. Do not install paver "slivers." If the smallest side of a paver is less than 1-1/2 inches along the edge of the pattern, remove the adjacent whole paver and cut two replacement pavers such that they are equal in length.
- D. Joint Pattern: As indicated.
- E. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide compressible foam filler as backing for sealant-filled joints. Install joint filler before setting pavers. Sealant materials and installation are specified in Section 07 92 00 "Joint Sealants."
- F. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
 - 1. For metal edge restraints, install as detailed.
 - 2. Install job-built concrete edge restraints to comply with requirements in Section 03 30 00 "Cast-in-Place Concrete."

3.4 BITUMINOUS SETTING-BED APPLICATIONS

- A. Apply primer to concrete slab or binder course immediately before placing setting bed.
- B. Prepare for setting-bed placement by locating 3/4-inch-deep control bars approximately 11 feet apart and parallel to one another, to serve as guides for striking board. Adjust bars to subgrades required for accurate setting of paving units to finished grades indicated.
- C. Place bituminous setting bed where indicated, in panels, by spreading bituminous material between control bars. Spread mix at a minimum temperature of 250 deg F. Strike setting bed smooth, firm, even, and not less than 3/4 inch thick. Add fresh bituminous material to low, porous spots after each pass of striking board. After each panel is completed, advance first control bar to next position in readiness for striking adjacent panels. Carefully fill depressions that remain after removing depth-control bars.
 - 1. Roll setting bed with power roller to a nominal depth of 3/4 inch. Adjust thickness as necessary to allow accurate setting of unit pavers to finished grades indicated. Complete rolling before mix temperature cools to 185 deg F.
- D. Apply neoprene-modified asphalt adhesive to cold setting bed by squeegeeing or troweling to a uniform thickness of 1/16 inch. Apply at a coverage rate of 40 square feet per gallon by troweling so as to provide a complete and adequate bond. The adhesive shall be spread at least two hours before setting the pavers. Proceed with setting of paving units only after adhesive is tacky and surface is dry to touch.
- E. Place pavers carefully by hand in straight courses, maintaining accurate alignment and uniform top surface. Unit Pavers shall be placed with sufficient pressure to achieve a full bond to the setting bed. The surface of the paving units shall set with a light roller or vibratory plate to compact the pavers into place. Ensure that sufficient adhesive is being applied by lifting random pavers during installation to verify complete coating of the underside with adhesive. Protect newly laid pavers with plywood panels on which workers can stand. Advance protective panels as work progresses, but maintain protection in areas subject to continued movement of materials and equipment to avoid creating depressions or disrupting alignment of pavers. If additional leveling of paving is required, and before treating joints, roll paving with power roller after sufficient heat has built up in the surface from several days of hot weather.
- F. Joint Treatment: Place unit pavers with hand-tight joints unless noted otherwise.
 - 1. For concrete or brick units without spacing tabs/lugs, place units to provide 1/16" wide joints.
 - 2. Fill joints by sweeping sand over paved surface until joints are filled. Remove excess sand after joints are filled.

3.5 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units

and install in same manner as original units, with same joint treatment and with no evidence of replacement.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Unit Paver, Type 1 will be measured at the unit price per Square Foot.
- 4.2 Unit Paver, Type 2 will be measured at the unit price per Square Foot.
- 4.3 Unit Paver, Type 3 will be measured at the unit price per Square Foot.
- 4.4 Metal Edge Restraint, Type 1 will be measured at the unit price per Linear Foot.
- 4.5 Metal Edge Restraint, Type 2 will be measured at the unit price per Linear Foot.
- 4.6 Metal Edge Restraint, Type 3 will be measured at the unit price per Linear Foot.
- 4.7 All excavation, backfill, aggregate, concrete, concrete headers, bituminous setting bed, joint material, fasteners, anchors, incidental materials, and work necessary for a complete installation of Unit Paver, Type 1, Unit Paver, Type 2, and Unit Paver, Type 3 will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Unit Paver, Type 1 shall be paid for at the unit price per Square Foot.
- 5.2 The cost of Unit Paver, Type 2 shall be paid for at the unit price per Square Foot.
- 5.3 The cost of Unit Paver, Type 3 shall be paid for at the unit price per Square Foot.
- 5.4 The cost of Metal Edge Restraint, Type 1 shall be paid for at the unit price per Linear Foot.
- 5.5 The cost of Metal Edge Restraint, Type 2 shall be paid for at the unit price per Linear Foot.
- 5.6 The cost of Metal Edge Restraint, Type 3 shall be paid for at the unit price per Linear Foot.
- 5.7 The cost of all excavation, backfill, aggregate, concrete, concrete headers bituminous setting bed, joint material, fasteners, anchors, incidental materials, and work necessary for a complete installation of Unit Paver, Type 1, Unit Paver, Type 2, and Unit Paver, Type 3 shall be included in the cost of the respective pay items of which they are a part of.
- 5.8 Payment will be made under:

- A. **Pay Item** **Pay Unit**

Unit Paver, Type 1	SQUARE FOOT
Unit Paver, Type 2	SQUARE FOOT
Unit Paver, Type 3	SQUARE FOOT
Metal Edge Restraint, Type 1	LINEAR FOOT
Metal Edge Restraint, Type 2	LINEAR FOOT
Metal Edge Restraint, Type 3	LINEAR FOOT

5.9 This price and payment will be full compensation for furnishing all pay items noted above.

END OF SECTION 32 1400

SECTION 32 1443 - POROUS UNIT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Clay pavers with openings between pavers filled with aggregate.
 - 2. Aggregate setting bed for pavers.
- B. Related Requirements:
 - 1. Section 31 2000 "Earth Moving" for excavation and compacted subgrade.
 - 2. Section 32 1313 "Concrete Paving" for cast-in-place concrete curbs that serve as edge restraints for porous paving.
 - 3. Section 32 1400 "Unit Paving" for nonporous unit paving.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For materials other than aggregates.
- B. Product Data: For the following:
 - 1. Pavers.
 - 2. Edge restraints.
 - 3. Geotextiles.
- C. Sieve Analyses: For aggregate materials, according to ASTM C 136.
- D. Samples:
 - 1. Three (3) sets of full-size units of each type of unit paver indicated in full range of color and textures specified for each type of unit paver indicated.
 - 2. Exposed edge restraints.
 - 3. Aggregate fill.
 - 4. Aggregate setting bed materials.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.

- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.
 - 1. For solid interlocking paving units, include test data for freezing and thawing according to ASTM C 67.

- C. Qualification Data: For Installer

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Pavers: One (1) pallet of each paver type and color.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an Installer whose principal work activity is the installation of unit pavers.
 - 1. Installer shall demonstrate successful completion of at least three unit paver applications similar in type of paver, type of paver base materials, complexity and project size to that of this project within the last three years.
 - 2. The unit paver installer shall provide a single representative for oversight of the field installation and to support the Contractor for the duration of the project.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Initial mockup shall be used to confirm color selection.
 - 2. Each paver type and color shall be represented.
 - 3. Do not order remaining pavers until mockup is approved.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

PART 2 - PRODUCTS

2.1 PERMEABLE PAVER, TYPE 1

- A. Source Limitations: Obtain each type of paver from single source that has resources to provide materials and products of consistent quality in appearance and physical properties.

-
- B. Permeable Pavers, Type 1: Light-Traffic solid interlocking paving units of shapes that provide openings between units: complying with ASTM C902, Class SX, Type I, Application PS, resistant to freezing and thawing when tested according to ASTM C67, and made from normal-weight aggregates. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.
1. Manufacturer:
 - a. Whitacre-Greer, 1400 S. Mahoning Ave., Alliance, OH 44601.
 - b. Belden Brick Company, PO Box 20910, Canton, OH 44701
 - c. Approved Equal.
 2. Thickness: 2-1/4 inches.
 3. Face Size and Shape: 4 by 8 inches.
 4. Colors: Pattern as indicated on Drawings.
 - a. Type 2:
 - 1) Whitacre-Greer: #44 Mahogany
 - 2) Belden Brick Company: Kodiak Brown
 - b. Type 3:
 - 1) Whitacre-Greer: #30 Rustic Red
 - 2) Belden Brick Company: Admiral Red
- C. Permeable Pavers, Type 2 (Vehicular): Heavy Vehicular solid interlocking paving units of shapes that provide openings between units, complying with ASTM C1272, Class SX, Type I, Application PS, resistant to freezing and thawing when tested according to ASTM C67, and made from normal-weight aggregates. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.
1. Manufacturer:
 - a. Whitacre-Greer, 1400 S. Mahoning Ave., Alliance, OH 44601.
 - b. Belden Brick Company, PO Box 20910, Canton, OH 44701
 - c. Approved Equal.
 2. Thickness: 2-3/4 inches.
 3. Face Size and Shape: 4 by 8 inches.
 4. Colors: Pattern as indicated on Drawings.
 - a. Type 1:
 - 1) Whitacre-Greer: #33 Dark Antique
 - 2) Belden Brick Company: Regimental Red
 - b. Type 4:
 - 1) Whitacre-Greer: #50 Ivory
 - 2) Belden Brick Company: Ivory Bay
- D. Efflorescence: Brick to be rated “not effloresced” when tested according to ASTM C67.

2.2 AGGREGATE SETTING-BED MATERIALS

- A. General:
1. Crushed stone with 90% fractured faces, LA Abrasion < 40 per ASTM C 131.
 2. Do not use rounded river gravel for vehicular applications.
 3. All stone materials shall be washed with less than 2% passing the No. 200 sieve.

- B. Joint/opening filler, bedding, base and subbase aggregates: Conform to ASTM D 448 gradation as follows:
1. Graded Aggregate for Subbase: Sound crushed stone or gravel complying with ASTM No. 2.
 - a.

Sieve Size	Percent Passing
75 mm (3 in.)	100
63 mm (2-1/2 in.)	90 to 100
50 mm (2 in.)	35 to 70
37.5 mm (1-1/2 in.)	0 to 15
19 mm (3/4 in.)	0 to 5
 2. Graded Aggregate for Base Course: Sound crushed stone or gravel complying with ASTM No. 57.
 - a.

Sieve Size	Percent Passing
12.5 mm (1/2 in.)	100
9.5 mm (3/8 in.)	85 to 100
4.75 mm (No. 4)	10 to 30
2.36 mm (No. 8)	0 to 10
1.16 mm (No. 16)	0 to 5

(Note: No. 89 or No. 9 stone may be used to fill pavers with narrow joints.)
 3. Graded Aggregate for Leveling Course and Joint Filler: Sound crushed stone or gravel complying with ASTM No. 8.
 - a.

Sieve Size	Percent Passing
12.5 mm (1/2 in.)	100
9.5 mm (3/8 in.)	85 to 100
4.75 mm (No. 4)	10 to 30
2.36 mm (No. 8)	0 to 10
1.16 mm (No. 16)	0 to 5

(Note: No. 89 or No. 9 stone may be used to fill pavers with narrow joints.)
- C. 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 according to test methods referenced:
1. Survivability: Class 2; AASHTO M 288.
 2. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
 3. Permittivity: 0.5 per second, minimum; ASTM D 4491.
 4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proof-roll prepared subgrade according to requirements in Section 31 2000 "Earth Moving" to identify soft pockets and areas of excess yielding. Proceed with porous paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for porous paving.

3.2 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be structurally unsound or visible in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
 - 1. Do not install paver “slivers.” If the smallest side of a paver is less than 1-1/2 inches along the edge of the pattern, remove the adjacent whole paver and cut two replacement pavers such that they are equal in length.
- D. Tolerances:
 - 1. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/16-inch unit-to-unit offset from flush.
 - 2. Variation from Level or Indicated Slope: Do not exceed 1/8 inch in 24 inches and 1/4 inch in 10 feet or a maximum of 1/2 inch.

3.3 SETTING-BED INSTALLATION

- A. Compact subgrade uniformly to at least 95 percent of ASTM D 1557 laboratory density.
- B. Place drainage geotextile over prepared subgrade, overlapping ends and edges at least 12 inches.
- C. Place aggregate subbase and base, compact by tamping with plate vibrator, and screed to depth indicated.
 - 1. The sub-base course shall be moistened and installed in lifts not to exceed six inches (6”), and each lift shall be compacted using a vibratory 10-15 ton smooth-drum roller making at least two passes without wrinkling or folding geotextile and until there is no visible movement of the No. 2 stone.
 - 2. Upon completion of the sub-base course installation, the area shall be proof-rolled using a heavy rubber-tired vehicle (such as a loaded tandem truck) to identify any areas requiring additional compaction.
 - 3. The sub-base course shall be installed to the elevation and cross-section per the plan documents. The surface tolerance of the compacted No. 2 subbase shall be $\pm 2 \frac{1}{2}$ in. (± 65 mm) over a 10 ft (3 m) straightedge.
 - 4. Moisten and place base course in one lift and compact using a vibratory 10-15 ton smooth-drum roller, making at least two passes in the vibratory mode then at least two in the static mode and until there is no visible movement of the No. 57 stone.. The base course shall be installed to the elevation and cross-section per the plan documents with a tolerance of plus or minus one half of an inch. The surface tolerance the compacted No. 57 base should not deviate more than. ± 1 in. (25mm) over a 10 ft (3 m) straightedge.

- D. Moisten and place leveling course, and screed to a thickness of 2 inches, taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.
1. The bedding course shall be spread loose in a uniform layer to provide a thickness of one (1") to two inches (2") after compaction. Bedding course shall not exceed two inches (2").
 2. Screed the bedding course using either an approved mechanical screed apparatus or by the use of screed guides and boards.
 3. Screeded bedding aggregate shall not be subjected to any traffic by either mechanical equipment or pedestrian use prior to the installation of the paver units.
 4. Voids left after the removal of the screed rails shall be filled with loose aggregate as the paver bedding course proceeds.

3.4 PAVER INSTALLATION

- A. Inspection:
1. Inspect and clean the surface to receive pavers to ensure that it meets the grade requirements and the area is free from standing water or obstructions prior to commencing paver installation.
 2. Rectify any deviations in the underlying surface levels prior to the installation of the pavers.
 3. All edge restraints shall be constructed as shown on the plans and in place prior to the installation of the pavers and base course.
 4. Visually inspect pavers prior to installation and any units that display any obvious signs of damage, including but not limited to chipping, cracking and staining, shall be set aside and not used.
- B. Set unit pavers on leveling course, being careful not to disturb leveling base.
1. Place pavers hand tight against lugs or spacer bars.
 2. Lay pavers in the pattern as shown on the drawings. Lay pavers away from the existing laying face or edge restraint in such a manner as to ensure that the pattern remains square. Chalk lines shall be used upon the bedding course to maintain straight joint lines. Lines and grades shown on the plans shall be established and maintained during the installation of the pavers.
 3. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size pavers.
 4. Install pavers in approximately the order in which they were manufactured. No cluster shall be installed next to a cluster that was manufactured more than 1,000 cycles before or after.
 5. The surface of the paving units shall set with a light roller or vibratory plate to compact the pavers into place. Surface elevations shall be checked to ensure that water does not pond after completion of the paving units. Surface shall not exceed 1/16 inch unit-to-unit offset from flush, and a tolerance of 1/8 inch in as measured with a 2 ft. straight edge and 3/16 inch as measured with a 10 ft. straight edge from level or slope as indicated, for finished surface of paving.
 6. Unit pavers shall be cut to fit the conditions of surface maintaining the specified pattern and the joint widths throughout. Pavers shall be cut using a masonry saw or coring devices. Block splitting shall not be permitted. All cut faces shall be

vertical and top edges shall be free from chips or other irregularities. Dry cutting of the pavers shall be performed utilizing a dust collection system. If wet cutting method used, paver surface must be washed while still wet to remove cement dust and slurry.

- C. Compact pavers into leveling course with a low-amplitude plate vibrator capable of at least 5000-lbf compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.
- D. Place graded aggregate fill immediately after vibrating pavers into leveling course. Spread and screed aggregate fill level with tops of pavers.
 - 1. Before ending each day's work, compact pavers and place aggregate fill in installed porous paving except for 42-inch width of unfilled paving adjacent to temporary edges (laying faces).
 - 2. As work progresses to perimeter of installation, compact pavers and place aggregate fill in installed paving that is adjacent to permanent edges unless it is within 42 inches of laying face.
 - 3. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.
 - 4. Surface elevations shall be checked to ensure that water does not pond after completion of the paving units. Surface tolerances shall be within 3/16 in. as measured with a 10 ft. straight edge; there shall not be any difference in elevation in the pavers of greater than 1/16 in.
 - 5. Newly laid unit pavers shall be protected with panels of plywood on which workers stand. Advance protective panels as work progresses by maintaining protection in areas subject to continued movement of materials and equipment, to avoid creating depressions or disrupting alignment of unit pavers.
- E. As work progresses, remove and replace pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- F. Protection: Provide final protection and maintain conditions in a manner acceptable to the Owner, to ensure that the joint between the unit pavers stay clean, free from dirt and construction debris, and that the condition of the pavers do not deteriorate or become damaged prior to final acceptance of the project.
- G. Cleaning: Provide final cleaning of installed paver work. Unit paver work shall be inspected by the Architect to identify any residue or ground-in dirt, sand, markings, and other debris left from the construction process prior to acceptance. All surfaces needing any cleaning or repair shall be cleaned by the Contractor with a stiff brush and water or low pressure spray wash until all the stains, dirt, sand etc., are removed. Cleaning solutions as recommended by the manufacture may be used.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Permeable Pavers, Type 1 will be measured at the unit price per Square Foot.
- 4.2 Permeable Pavers, Type 2 will be measured at the unit price per Square Foot.
- 4.3 All excavation, backfill, aggregate, joint material, geogrid, incidental materials, and work necessary for a complete installation of Permeable Pavers, Type 1 and Permeable Pavers, Type 2 will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Permeable Pavers, Type 1 shall be paid for at the unit price per Square Foot.
- 5.2 The cost of Permeable Pavers, Type 2 shall be paid for at the unit price per Square Foot.
- 5.3 The cost of all excavation, backfill, aggregate, geogrid, joint material, incidental materials, and work necessary for a complete installation of Permeable Pavers, Type 1 and Permeable Pavers, Type 2 shall be included in the cost of the respective pay items of which they are a part of.

5.4 Payment will be made under:

A. <u>Pay Item</u>	<u>Pay Unit</u>
Permeable Pavers, Type 1	SQUARE FOOT
Permeable Pavers, Type 2	SQUARE FOOT

5.5 This price and payment will be full compensation for furnishing all pay items noted above.

END OF SECTION 32 1443

SECTION 32 1713 - PARKING BUMPERS

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. Precast concrete parking barrier.
- B. Related Requirements:
 - 1. 2022 Indiana Department of Transportation Standard Specifications, Section 615.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment.

1.4 ACTION SUBMITTALS

- A. Product Data:
 - 1. Precast concrete parking barrier.

PART 2 - PRODUCTS

2.1 PARKING BUMPERS

- A. Precast Concrete Parking Barriers: Precast, steel-reinforced, air-entrained concrete; 4000-psi minimum compressive strength; 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two factory-formed or -drilled vertical holes through parking barrier for anchoring to substrate.
 - 1. Source Limitations: Obtain parking barriers from single source from single manufacturer.
 - 2. Surface Appearance: Smooth, free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
 - 3. Surface Sealer: Manufacturer's standard salt-resistant, clear sealer, applied at precasting location.
 - 4. Mounting Hardware: Galvanized-steel spike or dowel, 1/2-inch diameter, 14-inch minimum length.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation in accordance with manufacturer's written instructions.

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

3.2 INSTALLATION

- A. Install parking barriers in accordance with manufacturer's written instructions unless otherwise indicated.
- B. Securely anchor parking barriers to substrate with hardware in each preformed vertical hole in parking barrier as recommended in writing by manufacturer. Recess head of hardware beneath top of parking barrier.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Parking Barrier, Concrete will be measured at the contract unit price per Each completely installed and accepted in accordance with requirements of this Section.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Parking Barrier, Concrete shall be paid for at the contract unit price per Each.

END OF SECTION 32 1713

SECTION 32 1723 - PAVEMENT MARKINGS

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. Painted markings applied to asphalt paving.
 - 2. Painted markings applied to concrete surfaces.
- B. Related Requirements:
 - 1. 2022 Indiana Department of Transportation Standard Specifications, Section 808.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment.

1.4 ACTION SUBMITTALS

- A. Product Data: Include technical data and tested physical and performance properties.
 - 1. Pavement-marking paint, acrylic.
 - 2. Glass beads.
- B. Shop Drawings:
 - 1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
 - 2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Construction Standards of City of Bloomington and 2022 Standard Specifications of Indiana Department of Transportation for pavement-marking work.
 - 1. Safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain pavement-marking paints from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.3 PAVEMENT-MARKING PAINT

- A. Pavement-Marking Paint, Acrylic: Acrylic, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952F, Type II, with drying time of less than 45 minutes.
 - 1. Color: As indicated.
- B. Glass Beads: AASHTO M 247, Type 1 or FS TT-B-1325D, Type 1.
 - 1. Roundness: Minimum 75 percent true spheres by weight.
- C. Thermoplastic Pavement Marking: Thermoplastic preformed plastic or multi-component pavement marking. Material shall not contain any heavy metals of the regulatory limits of 40 CFR 261.24, Table 1, when tested in accordance with EPA TCLP, or contain any material which will require characterization as a hazardous waste.
 - 1. Solid form, heat bonded in accordance with AASHTO M 249 or furnished in a preformed state and shall not contain lead chromate pigments.
 - 2. Capable of fusing to itself when heated.
 - 3. Contain a minimum of 30 percent beads by weight, homogenously blended throughout the material.
 - 4. Minimum average thickness of 90 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement-marking substrate is dry and in suitable condition to begin pavement marking in accordance with manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.
- B. Allow asphalt paving or concrete surfaces to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material 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.
 - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to asphalt paving or concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
 - 2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal..

3.3 THERMOPLASTIC PAVEMENT MARKING

- A. As required by 2022 Indiana Department of Transportation, Standard Specifications for application of Durable Pavement Marking material.

3.4 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Pavement Markings shall be measured at the contract unit price per Linear Foot completed and accepted in accordance with INDOT Standard Specifications Section 808 Method of Measurement requirements and requirements of this Section.
- 4.2 Line, Paint, Solid, White, 4-inch shall be measured at the contract unit price per Lineal Foot completely furnished, installed and accepted in accordance with INDOT Standard Specifications Section 808 Method of Measurement and requirements of this Section.
- 4.3 Line, Paint, Solid, Blue, 4-inch shall be measured at the contract unit price per Lineal Foot completely furnished, installed and accepted in accordance with INDOT Standard Specifications Section 808 Method of Measurement and requirements of this Section.
- 4.4 Pavement Message Marking, Paint, ADA Accessible Symbol shall be measured at the contract unit price per Each completely furnished, installed and accepted in accordance with INDOT Standard Specifications Section 808 Method of Measurement, thermoplastic ADA parking message marking symbols noted on landscape drawings, and requirements of this Section.
- 4.5 Pavement Message Marking, Multi-Component, Lane Indication Arrow shall be measured at the contract unit price per Each completely furnished, installed and accepted in accordance with INDOT Standard Specifications Section 808 Method of Measurement and requirements of this Section.
- 4.6 Raised Pavement Markers shall be measured at the contract unit price per Each completely furnished, installed and accepted in accordance with INDOT Standard

Specifications, Section 808 requirements, Drawing requirements and requirements of this Section.

- 4.7 Pavement Marking graphic symbols, glass beads and other materials, if not measured as part of the Pay Items above, are considered incidental and will not be measured or paid for separately.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Line, Paint, Solid, White, 4-inch shall be paid for at the contract unit price per Lineal Foot.
- 5.2 The cost of Line, Paint, Solid, Blue, 4-inch shall be paid for at the contract unit price per Lineal Foot.
- 5.3 The cost of Pavement Message Marking Paint, ADA Accessible Symbol shall be paid for at the contract unit price per Each.
- 5.4 The cost of Pavement Message Marking, Multi-Component, Lane Indication Arrow shall be paid for at the contract unit price per Each.
- 5.5 The cost of Raised Pavement Markers shall be paid for at the contract unit price per Each.
- 5.6 The cost of Pavement Markings not included with the Pay Items above shall be considered incidental and will not be paid for separately.

END OF SECTION 32 1723

SECTION 32 1726 - TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cast-in-place detectable warning metal tiles.
- B. Related Requirements:
 - 1. INDOT and City of Bloomington Standard Specifications
 - a. Where there is a discrepancy between INDOT/City of Bloomington standard specifications and those included herein, the more stringent of the two shall apply.
 - 2. Section 32 1313 "Concrete Paving" for concrete walkways serving as substrates for tactile warning surfacing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Mortar and Grout:
 - 1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and windbreaks, and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.
 - a. When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set unit pavers within 1 minute of spreading setting-bed mortar.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering and wear.
 - b. Separation or delamination of materials and components.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING, GENERAL

- A. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for tactile warning surfaces.
1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.
- B. Source Limitations: Obtain each type of tactile warning surfacing, anchor, and fastener from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 DETECTABLE WARNING TILES

- A. Cast-in-Place Detectable Warning Metal Tiles: Accessible truncated-dome detectable warning metal tiles configured for setting flush in new concrete walkway surfaces, with slip-resistant surface treatment on domes and field of tile.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. EJ; Duralast Cast-Iron 24x24" Detectable Warning Plate.
 - b. Approved equivalent complying with City of Bloomington's Memorandum 18-02 "Approved Materials List, Detectable Warning Plate".
 2. Material:
 - a. Cast Iron: Gray iron, ASTM A 48/A 48M, CL 35.
 - 1) Finish and Color:
 - a) Manufacturer's standard asphaltic coat, black.
 - b) Detectable warning surfaces shall contrast visually with adjacent walking surfaces – either light-on-dark, or dark-on-light.
 3. Shapes and Sizes:
 - a. Rectangular panel, 24 by 24 inches.
 4. Dome Spacing and Configuration: Manufacturer's standard compliant spacing, in manufacturer's standard pattern.
 5. Mounting:
 - a. Permanently embedded detectable warning tile wet-set into freshly poured concrete.

2.3 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of tactile warning surfaces, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Furnish Type 304 stainless-steel fasteners for exterior use.
 - 2. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant heads, colored to match tile.
- B. Adhesive: As recommended by manufacturer for adhering tactile warning surfacing unit to pavement.
- C. Sealant: As recommended by manufacturer for sealing perimeter of tactile warning surfacing unit.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF TACTILE WARNING SURFACING

- A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.
- B. Place tactile warning surfacing units in dimensions and orientation indicated. Comply with location requirements of AASHTO MP 12.

3.3 INSTALLATION OF DETECTABLE WARNING TILES

- A. Cast-in-Place Detectable Warning Tiles:
 - 1. Concrete Paving Installation: Comply with installation requirements in Section 32 1313 "Concrete Paving." Mix, place, and finish concrete to conditions complying with detectable warning tile manufacturer's written requirements for satisfactory embedment of tile.
 - 2. Set each detectable warning tile accurately and firmly in place and completely seat tile back and embedments in wet concrete by tamping or vibrating. If necessary, temporarily apply weight to tiles to ensure full contact with concrete.
 - 3. Set surface of tile flush with surrounding concrete and adjacent tiles, with variations between tiles and between concrete and tiles not exceeding plus or minus 1/8 inch from flush.
 - 4. Protect exposed surfaces of installed tiles from contact with wet concrete. Complete finishing of concrete paving surrounding tiles. Remove concrete from tile surfaces.
 - 5. Clean tiles using methods recommended in writing by manufacturer.

3.4 CLEANING AND PROTECTION

- A. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Architect. Replace using tactile warning surfacing installation methods acceptable to Architect.
- B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Detectable Warning Surface will be measured at the unit price per square foot.
- 4.2 All excavation, backfill, aggregate, concrete, mortar, joint material, incidental materials, and work necessary for a complete installation of Detectable Warning Surface will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Detectable Warning Surface shall be paid for at the unit price per square foot.
- 5.2 The cost of all excavation, backfill, aggregate, concrete, mortar, joint material, incidental materials, and work necessary for a complete installation of Detectable Warning Surface shall be included in the cost of the pay item Detectable Warning Surface
- 5.3 Payment will be made under:
 - A.

<u>Pay Item</u>	<u>Pay Unit</u>
Detectable Warning Surface	SQUARE FOOT
- 5.4 This price and payment will be full compensation for furnishing all pay items noted above.

END OF SECTION 32 1726

SECTION 32 1813 - SYNTHETIC GRASS SURFACING

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 synthetic grass surfacing.
- B. Related Requirements:
 - 1. Section 31 2000 "Earth Moving" for preparation, compaction, and grading of granular base.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of synthetic grass surfacing indicated.
 - 1. Turf Fabric: 12 inches square.
 - 2. Infill Material: 4 oz. of each type.
 - 3. Shock-Attenuation Pad: 12 inches square.
 - 4. Seam Sample: 24 inches square with seam centered in sample.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each synthetic grass surfacing assembly. Submit the following test results from independent approved and certified testing laboratory:
 - 1. ASTM 1292-04 – Impact attenuation (per fall height requirements).
 - a. Impact attenuation test results shall met or exceed Consumer Product Safety Commission Guidelines for impact attenuation (G-max and Head Injury Criteria "H.I.C."). Test results must be administered and evaluated under the same test and these results must be shown for three drops at each required temperature: 32°F, 72°F, 120°F, yield less than 200 G's and less than 1,000 H.I.C. Only test results from ASTM-approved testing laboratories, F8 committee will be acceptable. Pre-approved testing laboratories are TSI and Detroit Testing.
 - 2. ASTM D-5848 – Pile height, Tuft spacing, Face weight, and Total weight.

3. ASTM D-1335 – Tuft bind.
4. ASTM D-5034 – Grab tear breaking strength.
5. ASTM D-2859 – Flammability (PILL test).
6. ASTM F-1551 – Water permeability.
 - a. Product shall meet or exceed a coefficient of permeability of five (5) feet per minute.
7. AST F-1015 – Abrasiveness index.

C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For synthetic grass surfacing, including maintenance cleaning instructions, to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Turf Fabric: Minimum of 300 sq. ft. for each type indicated.
 2. Infill: Minimum of two bags of each type.
 3. Seaming Tape and Adhesive: One roll of seaming tape and one gallon of adhesive.
 4. One new set of maintenance tools, of type recommended by synthetic grass surfacing manufacturer for installation.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and who has successfully installed work similar in design and extent to that require for this Project, in not less than five (10) projects of similar scope, to the satisfaction of the Architect; and whose work has resulted in construction with a record of successful in-service performance for a period of five (5) years.
1. Installer must be IPEMA certified to install the synthetic grass surfacing.

B. Manufacturer Qualifications: The proposed synthetic grass surfacing shall be manufactured in the United States of America.

C. All artificial grass and components shall be provided by a single source.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials in location and manner to allow installation of synthetic grass surfacing without excess disturbance of granular base.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace synthetic grass surfacing that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration and excessive wear.

b. Deterioration from UV light.

c. Excessive loss of shock attenuation.

d. Seam separation, including game lines and markings.

2. Warranty Period: **10 years** from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. All turf components and their installation methods shall be designed and manufactured for use on playgrounds. The materials specified herein shall withstand full climatic exposure in the location of the playground, be resistant to insect infestation, rot, fungus, mold and mildew; it shall also withstand ultra-violet rays and extreme heat; allow the free flow of water vertically through the playing surface and into the drainage system below the surface.

B. The seams of all system components shall provide a permanent, tight, secure, and hazard free playing surface.

C. Permeability: 8 in./h of rainfall capacity according to ASTM F 2898 or EN 15330-1.

2.2 SYNTHETIC GRASS SURFACING

A. Synthetic Grass Surfacing: Complete surfacing system, consisting of synthetic yarns bound to water-permeable backing and infill indicated, suitable for playgrounds.

1. Products: Subject to compliance with requirements, provide the following:

a. ForeverLawn® of Ohio, Inc. (a division of E.I. DuPont de Nemours and Company), Playground Grass ULTRA.

1) Contact: Conrad Troyer, 614-600-7888

- B. Turf Fabric: Woven turf fabric with multicolored fiber and UV resistance, complying with the following:
 - 1. Yarn Fiber: Slit-film XP polyethylene with anti-microbial agen ALPHASAN integrated into yard. Secondary blade is a heat textured nylon monofilament.
 - 2. Yarn Count: Primary 5040/1; Secondary 4200/8.
 - 3. Pile Weight: 108 oz./sq. yd. according to ASTM D 5848.
 - 4. Pile Height: 1-1/2 inches according to ASTM D 5823.
 - 5. Construction: Broadloom tufted, dual yarn, same row.
 - 6. Tuft gauge: 3/8 inch
 - 7. Backing: multi-layered, three part
 - a. First single layer: consists primarily of polyester, fiberglass, and polyurethane. 18 pic construction and 9 ounces
 - b. Second layer: urethane, 48 ounces
 - c. Third layer: geotextile fleect, 3.5 ounce
- C. Backing: provide perforations or drainage channels sufficient to meet permeability indicated.
 - 1. multi-layered, three part
 - a. First single layer: consists primarily of polyester, fiberglass, and polyurethane. 18 pic construction and 9 ounces
 - b. Second layer: urethane, 48 ounces
 - c. Third layer: geotextile fleect, 3.5 ounce
- D. Infill: Manufacturer's standard 10/20 or 14/20 crumb rubber infill.
- E. Seaming Method: Micro-mechanical bond seaming utilizing hook and loop technology, and reinforced with adhesive where necessary.

2.3 GEOGRID

- A. Provide Dupont Groundgrid within stone base on artificial turf slopes indicated on plans and in details.

2.4 MATERIALS

- A. Rubber Infill: Ground SBR crumb rubber mesh free of metal, nonmetal fibers, and contaminants; mesh size as recommended by synthetic grass surfacing manufacturer.
- B. Seam Adhesive: One- or two-part urethane, recommended or approved by synthetic grass surfacing manufacturer, and suitable for ambient conditions at time of installation.
- C. Seam Tape: Synthetic grass manufacturer's recommended seam tape.
- D. Seaming Cord: Seaming cord or thread, recommended by the synthetic grass surfacing manufacturer.
- E. Shock-Attenuation Pad: Porous composite consisting of expanded polypropylene, thickness as necessary to meet Critical Fall Height requirements of adjacent equipment. Provide shock-attenuation pad with permeability sufficient to meet synthetic

grass surfacing assembly permeability indicated. SafetyFoam Pro by Foreverlawn, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine base and other conditions, with Installer present, for compliance with requirements for installation tolerances, permeability, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Avoid disturbance of base during installation of turf fabric.
- B. Shock-Attenuation Pad Installation: Roll out pad and allow to relax a minimum of six hours prior to final fit and trim. Stagger head seams between adjacent rows. Fit seams snugly without stretching or forcing.
- C. Roll out turf fabric and allow to relax at least four hours prior to seaming.
- D. Provide seams flat and snug, with no gaps or fraying. Remove yarns that are trapped within seams. Attach turf fabric to perimeter restraint system as recommended by the manufacturer.
- E. Repair loose seams and bubbles formed due to expansion of turf fabric prior to installation of infill.
- F. Evenly broadcast and groom infill by machine in proportions and depth after settling as recommended by the manufacturer, and to meet indicated performance requirements. Rake fibers trapped by infill to surface.

3.3 PROTECTION

- A. Surface installer shall be responsible for the protection of the resilient safety surface during the installation process.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel in proper maintenance procedures for synthetic grass surfacing.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Artificial Turf, Standard will be measured at the unit price per square foot.
- 4.2 Artificial Turf, Fall Rated will be measured at the unit price per square foot.

- 4.3 All excavation, backfill, aggregate, seam tape, attenuation pad, joint materials, adhesive, cord, incidental materials, and work necessary for a complete installation of Artificial Turf, Standard and Artificial Turf, Fall Rated will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Artificial Turf, Standard shall be paid for at the unit price per square foot.

- 5.2 The cost of Artificial Turf, Fall Rated shall be paid for at the unit price per square foot.

- 5.3 The cost of all excavation, backfill, aggregate, seam tape, attenuation pad, joint materials, adhesive, cord, incidental materials, and work necessary for a complete installation of Artificial Turf, Standard and Artificial Turf, Fall Rated shall be included in the cost of Artificial Turf, Standard and Artificial Turf, Fall Rated.

- 5.4 Payment will be made under:

A.	Pay Item	Pay Unit
	Artificial Turf, Standard	SQUARE FOOT
	Artificial Turf, Fall Rated	SQUARE FOOT

- 5.5 This price and payment will be full compensation for furnishing all pay items noted above.

END OF SECTION 32 1813

SECTION 32 3300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 1. Planter Box
 2. Litter Receptacle
 3. Recycling Receptacle
 4. Bar Height Table
 5. Dining Height Table
 6. Bar Height Bench
 7. Dining Height Bench
 8. Lounge Bench
 9. Lounge Table, Type 1
 10. Lounge Table, Type 2
 11. Platform Bench, Type 1
 12. Platform Bench, Type 2
 13. Bench, Type 1
 14. Bench, Type 2
 15. Bench, Type 3
 16. Pavilion
 17. Swing, Structure
 18. Footbridge
 19. Paver Grate, Type 1
 20. Paver Grate, Type 2
 21. Cistern Access Hatch
 22. Umbrella
 23. Bike Rack, Type 1
 24. Bike Rack, Type 2
 25. Drinking Fountain
 26. Removable Bollard
 27. Bollard Rack, Type 1
 28. Bollard Rack, Type 2
 29. Ping Pong Table
 30. Site Furnishing Anchor
- B. Related Requirements:
 1. Section 03 3000 "Cast-in-Place Concrete" for exposed concrete and concrete foundations and footings.

2. Section 05 1200 "Structural Steel Framing" for steel requirements related to custom fabricated Pavilion, Swings, and Footbridge.
3. Section 05 3100 "Steel Decking" for steel requirements related to Footbridge.
4. Section 05 7000 "Decorative Metal" for metal work related to custom site furnishings.
5. Section 06 4013 "Exterior Architectural Woodwork" for fabricated exterior wood seating and platforms.
6. Section 09 9600 "High Performance Coatings" for finishes on custom fabricated furnishings.
7. Section 31 2000 "Earth Moving" for excavation for installing concrete footings.

1.3 ACTION SUBMITTALS

- A. Product Data:
 1. For each type of product.
 2. As required within Related Requirements specification sections noted above.
- B. Samples:
 1. For each exposed product and for each color and texture specified.
 2. As required within Related Requirements specification sections noted above.
- C. Samples for Initial Selection:
 1. For units with factory-applied finishes.
 2. As required within Related Requirements specification sections noted above.
- D. Samples for Verification: For each type of exposed finish, not less than 6-inch-long linear components and 4-inch-square sheet components.
 1. As required within Related Requirements specification sections noted above.
- E. Product Schedule: For site furnishings. Use same designations indicated within Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For site furnishings manufactured with preservative-treated wood.
 1. As required within Related Requirements specification sections noted above.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.
- B. As required within Related Requirements specification sections noted above.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Seatwall and Platform Bench Replacement Boards: No fewer than 5% of total board feet of full-size units for each size indicated.

PART 2 - PRODUCTS

- 2.1 Unless noted otherwise, all furnishings shall be furnished, assembled, and installed by the Contractor.
- 2.2 OWNER FURNISHED ITEMS: The following site furnishings will be furnished by the Owner. The Contractor shall provide all assembly and installation.
- A. PLANTER BOX:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Planterworx, 590 Oak St., Copiague, NY 11726, 718-963-0564.
 2. Model: The Standard Planter.
 - a. Options: With locking caster kit and drain holes.
 - b. Line base of planter with non-woven geotextile drainage filter fabric.
 3. Size:
 - a. Height: 24 inches.
 - b. Width: 84 inches.
 - c. Depth: 24 inches.
 4. Material: Aluminum.
 5. Finish: Powder Coat.
 - a. Color: Matte Black.
 6. Quantity: 10
- B. LITTER RECEPTACLE:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Forms + Surfaces, 30 Pine Street, Pittsburgh, PA 15223, 317-250-4800.
 2. Model:
 - a. Dispatch Litter
 - 1) Specs: Single-Stream, with one 45-gallon liner.
 - 2) Lift Lever Locking Latch.
 3. Mounting Type: Surface Mount.
 4. Material: Cast Aluminum.
 5. Finish: Powder Coat.
 - a. Color:
 - 1) Lid: Black Texture.
 - 2) Body: Black Texture.
 6. Quantity: 9
- C. RECYCLING RECEPTACLE:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Forms + Surfaces, 30 Pine Street, Pittsburgh, PA 15223, 317-250-4800.
 2. Model:
 - a. Dispatch Recycling.
 - 1) Specs: Single-Stream, with one 45-gallon liner.
 - 2) Lift Lever Locking Latch.

- 3) Options: Bottle and Can Recycle Openings (All Openings), 4.5” diameter round hole.
 3. Mounting Type: Surface Mount.
 4. Material: Cast Aluminum.
 5. Finish: Powder Coat.
 - a. Color:
 - 1) Lid: Silver Texture.
 - 2) Body: Slate Texture.
 6. Quantity: 9
- D. BAR HEIGHT TABLE:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Landscape Forms, Inc., 7800 E. Michigan Ave., Kalamazoo, MI, 269-337-1335.
 2. Model: Harvest, Standing Height.
 3. Mounting Type: Freestanding.
 - a. Provide shop-drilled thru holes to receive security cable.
 4. Material:
 - a. Top: HDPE.
 - b. Frame: Extruded Aluminum.
 5. Color:
 - a. Top: To be selected from Manufacturer’s full range.
 - b. Frame: Manufacturer’s custom color.
 6. Quantity: 2
- E. DINING HEIGHT TABLE:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Landscape Forms, Inc., 7800 E. Michigan Ave., Kalamazoo, MI, 269-337-1335.
 2. Model: Harvest, Dining Height.
 3. Mounting Type: Freestanding.
 - a. Provide shop-drilled thru holes to receive security cable.
 4. Material:
 - a. Top: HDPE.
 - b. Frame: Extruded Aluminum.
 5. Color:
 - a. Top: To be selected from Manufacturer’s full range.
 - b. Frame: Manufacturer’s custom color.
 6. Quantity: 4
- F. BAR HEIGHT BENCH:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Landscape Forms, Inc., 7800 E. Michigan Ave., Kalamazoo, MI, 269-337-1335.
 2. Model: Harvest, Standing Height.
 3. Mounting Type: Freestanding.

- a. Provide shop-drilled thru holes to receive security cable.
 4. Material:
 - a. Top: HDPE.
 - b. Frame: Extruded Aluminum.
 5. Color:
 - a. Top: To be selected from Manufacturer's full range.
 - b. Frame: Manufacturer's custom color.
 6. Quantity: 8
- G. DINING HEIGHT BENCH:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Landscape Forms, Inc., 7800 E. Michigan Ave., Kalamazoo, MI, 269-337-1335.
 2. Model: Harvest, Dining Height.
 3. Mounting Type: Freestanding.
 - a. Provide shop-drilled thru holes to receive security cable.
 4. Material:
 - a. Top: HDPE.
 - b. Frame: Extruded Aluminum.
 5. Color:
 - a. Top: To be selected from Manufacturer's full range.
 - b. Frame: Manufacturer's custom color.
 6. Quantity: 8
- H. LOUNGE BENCH:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Loll, 5912 Waseca Street, Duluth, MN 55807.
 2. Model: Picket, 48 inches.
 3. Mounting Type: Freestanding.
 - a. Provide manufacturer's standard T-bracket to receive security cable.
 4. Material: HDPE.
 - a. Color: To be selected from Manufacturer's full range.
 5. Quantity: 12
- I. LOUNGE TABLE, TYPE1:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Loll, 5912 Waseca Street, Duluth, MN 55807.
 2. Model: Satellite Cocktail Table (Round).
 3. Size: 36-inch diameter.
 4. Mounting Type: Freestanding.
 - a. Provide manufacturer's standard T-bracket to receive security cable.
 5. Material: HDPE.
 6. Color: To be selected from Manufacturer's full range.
 7. Quantity: 2
- J. LOUNGE TABLE, TYPE 2:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Loll, 5912 Waseca Street, Duluth, MN 55807.
2. Model: Fresh Air Cocktail Table 62.
3. Size:
 - a. Length: 62 inches.
 - b. Depth: 30 inches.
 - c. Height: 13 inches.
4. Mounting Type: Freestanding.
 - a. Provide manufacturer's standard T-bracket to receive security cable.
5. Material: HDPE.
6. Color: To be selected from Manufacturer's full range.
7. Quantity: 4

2.3 CONTRACTOR FURNISHED ITEMS: The following site furnishings will be furnished by the Contractor. The Contractor shall provide all assembly and installation.

A. PLATFORM BENCH, TYPE 1: See LA406

1. Custom fabricated as detailed within Contract Documents.
2. Seat Frame: Galvanized Steel.
3. Seat Support: C.I.P. Concrete.
4. Seat and back:
 - a. Material:
 - 1) Wood: Thermally modified red oak or thermally modified ash.
 - b. Seat Height: As Indicated.
 - c. Seat Surface Shape: As Indicated.
 - d. Overall Height: As Indicated.
 - e. Overall Width: As Indicated.
 - f. Overall Depth: As Indicated.
5. Steel Framework Finish: Galvanized, refer to Related Requirements.
6. Exposed Metal Finish: To be selected from manufacturer's full range.
7. Wood Finish: Fabricator applied finish, refer to Related Requirements.
 - a. Color: Flood Gray.
8. Concrete Finish: Hand rubbed, refer to Related Requirements.

B. PLATFORM BENCH, TYPE 2: See LA408

1. Custom fabricated as detailed within Contract Documents.
2. Seat Frame: Galvanized Steel.
3. Seat Support: C.I.P. Concrete.
4. Seat and back:
 - a. Material:
 - 1) Wood: Thermally modified red oak or thermally modified ash.
 - b. Seat Height: As Indicated.
 - c. Seat Surface Shape: As Indicated.
 - d. Overall Height: As Indicated.
 - e. Overall Width: As Indicated.
 - f. Overall Depth: As Indicated.
5. Steel Framework Finish: Galvanized, refer to Related Requirements.
6. Exposed Metal Finish: To be selected from manufacturer's full range.

7. Wood Finish: Fabricator applied finish, refer to Related Requirements.
 - a. Stain: Flood Gray.
 8. Concrete Finish: Hand rubbed, refer to Related Requirements.
- C. BENCH, TYPE 1: See LA407
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Landscape Forms, Inc., 7800 E. Michigan Ave., Kalamazoo, MI, 269-337-1335.
 2. Model: Bancal, Backless, 168-inch length, cantilever both ends, custom 4.25" leg extension
 3. Frame: Carbon Steel.
 4. Seat:
 - a. Material:
 - 1) Wood: Thermally Modified Ash.
 5. Steel Finish: Powder Coated.
 - a. Color: Matte Black.
 6. Wood Finish: Driftwood Gray, two coats, to match custom furnishings.
- D. BENCH, TYPE 2: See LA407
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Landscape Forms, Inc., 7800 E. Michigan Ave., Kalamazoo, MI, 269-337-1335.
 2. Model: Bancal, Backless, custom 120-inch length, cantilever both ends, custom 4.25" leg extension
 3. Frame: Carbon Steel.
 4. Seat:
 - a. Material:
 - 1) Wood: Thermally Modified Ash.
 5. Steel Finish: Powder Coated.
 - a. Color: Matte Black.
 6. Wood Finish: Driftwood Gray, two coats, to match custom furnishings.
- E. BENCH, TYPE 3: LA407
1. Custom fabricated as detailed within Contract Documents.
 2. Seat Frame: Galvanized Steel.
 3. Seat Support: C.I.P. Concrete.
 4. Seat and back:
 - a. Material:
 - 1) Wood: Thermally modified red oak or thermally modified ash.
 - b. Seat Height: As Indicated.
 - c. Seat Surface Shape: As Indicated.
 - d. Overall Height: As Indicated.
 - e. Overall Width: As Indicated.
 - f. Overall Depth: As Indicated.
 5. Steel Framework Finish: Galvanized, refer to Related Requirements.
 6. Exposed Metal Finish: To be selected from manufacturer's full range.
 7. Wood Finish: Fabricator applied finish, refer to Related Requirements.

- a. Color: Flood Gray.
 8. Concrete Finish: Hand rubbed, refer to Related Requirements.
- F. PAVILION: See LA410 & S103
1. Custom fabricated as detailed within Contract Documents.
 2. Structure: HSS Steel
 3. Wood Louvers: Thermally Modified Red Oak
 4. Dimensions:
 - a. Overall Height: As Indicated.
 - b. Overall Length: As Indicated.
 - c. Overall Width: As Indicated.
 5. Steel Finish: Painted, refer to Related Requirements.
 - a. Color: Matte Black.
 6. Wood Finish: Fabricator applied finish, refer to Related Requirements.
 - a. Color: Flood Gray.
 7. Note: Contractor shall provide the following pricing as separate pay items. The sum total of these three items will be the total value of the fabrication and installation of the Pavilion.
 - a. Footing, Pavilion
 - 1) Refer to Section 03 3000 – Cast-in-Place Concrete for additional information.
 - b. Pavilion
 - 1) Cost for complete structure delivered to Owner's storage area.
 - c. Pavilion, Installation
 - 1) Cost for complete erection of the Pavilion.
- G. SWING, STRUCTURE: See LA410 & S100
1. Custom fabricated as detailed within Contract Documents.
 2. Structure: HSS Steel.
 3. Wood Louvers: Thermally Modified Red Oak.
 4. Dimensions:
 - a. Overall Height: As Indicated.
 - b. Overall Length: As Indicated.
 - c. Overall Width: As Indicated.
 5. Steel Finish: Painted, refer to Related Requirements.
 - a. Color: Matte Black
 6. Wood Finish: Fabricator applied finish, refer to Related Requirements.
 - a. Color: Flood Gray.
- H. SWING, ASSEMBLY: LA 410 & S100
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Landscape Forms, Inc., 7800 E. Michigan Ave., Kalamazoo, MI, 269-337-1335.
 2. Model: See S431 Lounge Swing.
 3. Frame: Cast Aluminum.
 4. Seat:
 - a. Material:
 - 1) Wood: Thermally Modified Ash.

- b. Seat Height: As Indicated.
 - c. Overall Width: As Indicated.
 - d. Overall Depth: As Indicated.
 - 5. Aluminum Finish: Powder Coated.
 - a. Color: Matte Black.
 - 6. Steel Finish: Powder Coated.
 - a. Color: Matte Black.
 - 7. Wood Finish: Driftwood Gray, two coats, to match custom furnishings.
- I. FOOTBRIDGE: See LA409 & S101
- 1. Custom fabricated as detailed within Contract Documents.
 - 2. Structure: Steel.
 - 3. Deck: Unit Pavers, Type 1.
 - 4. Dimensions:
 - a. Overall Length: As Indicated.
 - b. Overall Width: As Indicated.
 - 5. Steel Finish: Painted, refer to Related Requirements.
 - a. Color: As selected by Architect from manufacturer's full range.
- J. PAVER GRATE, TYPE 1: See LA 402
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Citygreen USA, 5450 West 83rd Street, Los Angeles, CA 90045, 888-999-3990.
 - 2. Model: IVFP150MP34612
 - a. Options:
 - 1) Lifting Lugs
 - 2) 8" sq. x 1/4" thick hinged s. steel diamond plate access door with screwdriver cam latch.
 - 3. Frame: Galvanized Steel.
 - 4. Size: 60 inches square
 - 5. Rating: Class C, Wheel Weight of 5.5 tons
 - 6. Other: Refer to Section 32 9300 for Paver Grate installation.
- K. PAVER GRATE, TYPE 2: LA 402
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Citygreen USA, 5450 West 83rd Street, Los Angeles, CA 90045, 888-999-3990.
 - 2. Model: IVFP150MP34611
 - a. Options:
 - 1) Lifting Lugs
 - 2) 8" sq. x 1/4" thick hinged s. steel diamond plate access door with screwdriver cam latch.
 - 3. Frame: Galvanized Steel.
 - 4. Size: 60 inches square.
 - 5. Rating: Class C, Wheel Weight of 5.5 tons.
 - 6. Other: Refer to Section 32 9300 for Paver Grate installation.

L. CISTERN ACCESS HATCH

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. WunderCovers Inc., 3432 Denmark Ave., Suite 214, Eagan, MN 55123. 508-829-2112. sales@wundercovers.com.
 - 1) Product: Custom Paver Tray with four inserts. Provide weep holes at base of tray.
 - 2) Material: 304 Stainless Steel.
 - 3) Frame Size: 60 by 60 inches nominal.
 - 4) Tray Depth: 3 1/2 inches.
 - b. Fabricate access hatch to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
 - c. Fabricate true to line and level with accurate angles and surfaces. The hatch shall fit together with uniform joints and spacing. The hatch shall be flat and free from shrinkage, distortion, warping, or other defects.
 - d. Cut unit pavers to fit in hatch tray ensuring a secure fit against the frame of the hatch.

M. UMBRELLA: See LA 406

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Tuuci, 1000 SE 8th Street, Miami-Hialeah, FL 33010, 305-634-5116.
2. Model: Ocean Max Single Cantilever, Easy Drive Crank with Telescoping Mast.
3. Size: 10' x 14'.
4. Frame: Aluminum.
5. Finish: Powder Coat.
 - a. Color: Ash Gray.
6. Fabric Color: Portofino (9043)

N. BICYCLE RACK, TYPE 1:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Landscape Forms, Inc., 7800 E. Michigan Ave., Kalamazoo, MI, 269-337-1335.
2. Model: Bola.
3. Mounting Type: Surface Mount. Provide modified frame length to extend 4 3/4 inches below top of pavers as indicated on Drawings.
4. Material: Carbon Steel.
5. Finish: Powder Coat.
 - a. Color: Mercury.

O. BICYCLE RACK, TYPE 2:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Landscape Forms, Inc., 7800 E. Michigan Ave., Kalamazoo, MI, 269-337-1335.
2. Model: Bola.
3. Mounting Type: Embedded.

4. Material: Carbon Steel
 5. Finish: Powder Coat.
 - a. Color: Mercury.
- P. DRINKING FOUNTAIN:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Most Dependable Fountains, 5705 Commander Drive, Arlington, TN 38002, 901-867-0039.
 2. Models: 10145 SMSS ADA Bi-level Drinking Fountain with Bottle Filler and Dog Bowl.
 3. Mounting Type: Surface Mount.
 - a. Provide manufacturer's custom base plate extension when placed adjacent to pavers.
 4. Material: Stainless Steel.
 5. Finish: Powder Coat.
 - a. Color: Black.
- Q. REMOVABLE BOLLARD:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. TrafficGuard, Inc., PO Box 201, Geneva, IL 60134, 877-727-7347.
 2. Model: Locking Key, Removable Bollard, HL2004 S10.
 3. Mounting Type: Removable, Pier Foundation.
 4. Material: Carbon Steel
 5. Finish: Powder Coat.
 - a. Color: Yellow with reflective tape.
- R. BOLLARD RACK, TYPE 1:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. TrafficGuard, Inc., PO Box 201, Geneva, IL 60134, 877-727-7347.
 2. Model: SR-4, (6) storage.
 3. Mounting Type: Surface Mount.
 4. Material: Steel.
 5. Finish: Powder Coat.
 - a. Color: To be selected by Architect from manufacturer's full range.
- S. BOLLARD RACK, TYPE 2:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. TrafficGuard, Inc., PO Box 201, Geneva, IL 60134, 877-727-7347.
 2. Model: SR-4, (4) storage.
 3. Mounting Type: Surface Mount.
 4. Material: Steel.
 5. Finish: Powder Coat.
 - a. Color: To be selected by Architect from manufacturer's full range.
- T. PING PONG TABLE:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Henge, Inc., 40 Stuyvesant St. #3, New York, NY 10003, 212-777-6539.
2. Model: T20.
3. Options: City Grid Net, Stainless Steel Finish.
4. Size:
 - a. Length: 108 inches.
 - b. Width: 60 inches.
 - c. Height: 30 inches.
5. Mounting Type: Freestanding.
6. Material: Precast Concrete.
7. Finish: Silk.

U. Site Furnishing Anchor

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Liberty Hardware Manufacturing Corporation, 140 Business Park Dr., Winston-Salem, NC 27107, 336-769-4077
2. Model: Vortex, 16" Helical Landscape Anchor with Clevis Ring
3. Finish: Painted, color to be selected by Owner/Architect.

2.4 MATERIALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:

1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B211.
2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B221.
3. Structural Pipe and Tube: ASTM B429/B429M.
4. Sheet and Plate: ASTM B209.
5. Castings: ASTM B26/B26M.

B. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A36/A36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A53/A53M, or electric-resistance-welded pipe complying with ASTM A135/A135M.
3. Tubing: Cold-formed steel tubing complying with ASTM A500/A500M.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A513/A513M, or steel tubing fabricated from steel complying with ASTM A1011/A1011M and complying with dimensional tolerances in ASTM A500/A500M; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A1011/A1011M.
6. Perforated Metal: From steel sheet not less than 0.120-inch nominal thickness; manufacturer's standard perforation pattern.
7. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F1267.
8. Malleable-Iron Castings: ASTM A47/A47M, grade as recommended by fabricator for type of use intended.
9. Gray-Iron Castings: ASTM A48/A48M, Class 200.

- C. Stainless Steel: Free of surface blemishes and complying with the following:
 - 1. Sheet, Strip, Plate, and Flat Bars: ASTM A240/A240M or ASTM A666.
 - 2. Pipe: Schedule 40 steel pipe complying with ASTM A312/A312M.
 - 3. Tubing: ASTM A554.
- D. Wood: Surfaced smooth on four sides with eased edges; kiln dried, free of knots, solid stock of species indicated.
 - 1. Certified Wood: Wood products shall be certified as “FSC Pure” according to FSC STD-010001 and FSC STD-40-004.
 - 2. Finish: Manufacturer's standard.
- E. Fiberglass: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.
- F. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
- G. Anchors, Fasteners, Fittings, and Hardware: Stainless Steel; commercial quality, tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged.
 - 1. Angle Anchors: For inconspicuously bolting legs of site furnishings to below-grade substrate; one per leg.
- H. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M; recommended in writing by manufacturer, for exterior applications.
- I. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.
- J. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
 - 1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil thick.
 - 2. Hot-Dip Galvanizing: According to ASTM A123/A123M, ASTM A153/A153M, or ASTM A924/A924M.

2.5 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment: Pressure-treat wood according to AWP A U1, Use Category UC3b, and the following:
 - 1. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed

through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.

2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.

2.6 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWWA M4 to cut surfaces.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.7 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.9 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

- B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

2.10 IRON FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.11 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 1. Run directional finishes with long dimension of each piece.
 2. Directional Satin Finish: ASTM A480/A480M, No 4.
 3. Dull Satin Finish: ASTM A480/A480M, No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored or position at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.
- F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Platform Bench, Type 1 will be measured at the unit price per Each.
- 4.2 Platform Bench, Type 2 will be measured at the unit price per Lump Sum.
- 4.3 Bench, Type 1 will be measured at the unit price per Each.
- 4.4 Bench, Type 2 will be measured at the unit price per Each.
- 4.5 Bench, Type 3 will be measured at the unit price per Lump Sum.
- 4.6 Pavilion will be measured at the unit price per Lump Sum.
- 4.7 Pavilion, Installation will be measured at the unit price per Lump Sum.
- 4.8 Swing will be measured at the unit price per Each.
- 4.9 Swing, Assembly will not be measured for payment.
- 4.10 Footbridge will be measured at the unit price per Lump Sum.
- 4.11 Excavation, backfill, cast-in-place concrete, concrete paving, unit paving, bituminous setting bed, joint material, grout, structural steel framing, decorative metal, metal edging, anchors, fasteners, and all miscellaneous and incidental materials and labor necessary for a complete installation of Footbridge will not be measured for payment.
- 4.12 Paver Grate, Type 1 will be measured at the unit price per Each.
- 4.13 Paver Grate, Type 2 will be measured at the unit price per Each.
- 4.14 Umbrella will be measured at the unit price per Each.
- 4.15 Bicycle Rack, Type 1 will be measured at the unit price per Each.
- 4.16 Bicycle Rack, Type 2 will be measured at the unit price per Each.

- 4.17 Drinking Fountain will be measured at the unit price per Each.
- 4.18 Removable Bollard will be measured at the unit price per Each.
- 4.19 The cost of Footing, Removable Bollard will not be measured for payment.
- 4.20 Bollard Rack, Type 1 will be measured at the unit price per Each.
- 4.21 Bollard Rack, Type 2 will be measured at the unit price per Each.
- 4.22 Ping Pong Table will be measured at the unit price per Each.
- 4.23 Site Furnishing Anchor will be measured at the unit price per Each.
- 4.24 Excavation, backfill, cast-in-place concrete, joint material, grout, structural steel framing, decorative metal, exterior architectural woodwork, anchors, brackets, fasteners, and all miscellaneous and incidental materials and labor necessary for a complete installation will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Platform Bench, Type 1 shall be paid for at the unit price per Each.
- 5.2 The cost of Platform Bench, Type 2 shall be paid for at the unit price per Lump Sum.
- 5.3 The cost of Bench, Type 1 shall be paid for at the unit price per Each.
- 5.4 The cost of Bench, Type 2 shall be paid for at the unit price per Each.
- 5.5 The cost of Bench, Type 3 shall be paid for at the unit price per Lump Sum.
- 5.6 The cost of Pavilion shall be paid for at the unit price per Lump Sum.
- 5.7 The cost of Pavilion, Installation shall be paid for at the unit price per Lump Sum.
- 5.8 The cost of all electrical components necessary for a complete installation of Pavilion shall be included in the cost of Pavilion.
- 5.9 The cost of Swing, Structure shall be paid for at the unit price per Each.
- 5.10 The cost of Swing, Assembly shall be included in the cost of Swing, Structure.
- 5.11 The cost of Footbridge shall be paid for at the unit price per Lump Sum.
- 5.12 The cost of Site Furnishing Anchor shall be paid for at the unit price per Each.
- 5.13 The cost of excavation, backfill, cast-in-place concrete, concrete paving, unit paving, bituminous setting bed, joint material, grout, structural steel framing, decorative metal, metal edging, anchors, fasteners, and all miscellaneous and incidental materials and

labor necessary for a complete installation of Footbridge shall be included in the cost of Footbridge.

- 5.14 The cost of Paver Grate, Type 1 shall be paid for at the unit price per Each.
- 5.15 The cost of Paver Grate, Type 2 shall be paid for at the unit price per Each.
- 5.16 The cost of Umbrella shall be paid for at the unit price per Each.
- 5.17 The cost of Bicycle Rack, Type 1 shall be paid for at the unit price per Each.
- 5.18 The cost of Bicycle Rack, Type 2 shall be paid for at the unit price per Each.
- 5.19 The cost of Drinking Fountain shall be paid for at the unit price per Each.
- 5.20 The cost of Removable Bollard shall be paid for at the unit price per Each.
- 5.21 The cost of Footing, Removable Bollard shall be included in the cost of Removable Bollard.
- 5.22 The cost of Bollard Rack, Type 1 shall be paid for at the unit price per Each.
- 5.23 The cost of Bollard Rack, Type 2 shall be paid for at the unit price per Each.
- 5.24 The cost of Ping Pong Table shall be paid for at the unit price per Each.
- 5.25 The cost of excavation, backfill, cast-in-place concrete footings and foundations, joint material, grout, structural steel framing, decorative metal, exterior architectural woodwork, anchors, brackets, fasteners, and all miscellaneous and incidental materials and labor necessary for a complete installation shall be included in the cost of the associated pay items.
- 5.26 Payment will be made under:

A.	<u>Pay Item</u>	<u>Pay Unit</u>
	Platform Bench, Type 1	EACH
	Platform Bench, Type 2	LUMP SUM
	Bench, Type 1	EACH
	Bench, Type 2	EACH
	Bench, Type 3	LUMP SUM
	Pavilion	LUMP SUM
	Pavilion, Installation	LUMP SUM

Swing, Structure	EACH
Footbridge	LUMP SUM
Paver Grate, Type 1	EACH
Paver Grate, Type 2	EACH
Umbrella	EACH
Bicycle Rack, Type 1	EACH
Bicycle Rack, Type 2	EACH
Drinking Fountain	EACH
Removable Bollard	EACH
Bollard Rack, Type 1	EACH
Bollard Rack, Type 2	EACH
Ping Pong Table	EACH
Site Furnishing Anchor	EACH

5.27 This price and payment will be full compensation for furnishing all pay items noted above.

END OF SECTION 32 3300

SECTION 32 84 00 - LANDSCAPE IRRIGATION

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish all labor, materials, supplies, equipment, tools and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the irrigation system, and guarantee/warranty as shown on the drawings, the installation details, and as specified herein.

1.2 ITEMS OF WORK INCLUDED

- A. Items of work specifically included are:
 - 1. Procurement of all applicable licenses, permits, and fees associated with the installation of the irrigation system.
 - 2. Coordination of Utility Location. (“Call Before You Dig”)
 - 3. Excavation, installation and backfill of irrigation cistern.
 - 4. Excavation, installation and backfill irrigation cistern refill line.
 - 5. Installation, connection of all sensors, and programming of irrigation controller.
 - 6. Connection of electrical power supply to the irrigation control system.
 - 7. Installation of submersible pump and controls for irrigation system.
 - 8. Maintenance period.
 - 9. Sleeving for irrigation pipe and wire.

1.3 ITEMS OF WORK NOT INCLUDED

- A. Items of work specifically excluded are:
 - 1. Procurement of all applicable licenses, permits, and fees associated with the purchase and installation of the tap.
 - 2. Excavation, installation and backfill of tap into municipal water line.
 - 3. Excavation, installation and backfill of water meter and vault.
 - 4. Provision of electrical power supply to the irrigation control system.

1.4 RELATED WORK

- A. SECTION 32 9210 NATIVE SEEDING
- B. SECTION 32 9220 NATIVE PLUGS
- C. SECTION 32 9115 SOIL PREPARATION
- D. SECTION 32 9200 TURF AND GRASSES

E. SECTION 32 9300 PLANTS

1.5 SUBMITTALS

- A. Submit samples under provisions of Contract Documents
- B. Deliver four (4) copies of all required submittals to the Owners' Representative within fifteen (15) days from the date of the Notice to Proceed.
- C. Materials List: Include, pipe, fittings, mainline components, water emission components, control system components and all other components needed to construct a fully operating automatic irrigation system. At a minimum include all components specifically identified on the irrigation drawings. Quantities of materials need not be included.
- D. Manufacturers' Data: Submit manufacturers' catalog cuts, specifications, and operating instructions for equipment shown on the materials list. Highlight specific items to be utilized for construction of the irrigation system.
- E. Shop Drawings: Submit shop drawings called for in the installation details. Show products required for proper installation, their relative locations, and critical dimensions. Note modifications to the installation detail.
- F. Project Record Drawings: Submit project record (As-Built) drawings to Owner prior to commencement of maintenance period per Contract Documents. Accurate and complete project record drawings will be required before the maintenance period begins.

1.6 RULES AND REGULATIONS

- A. Work and materials shall be in accordance with the latest edition of the National Electric Code, the Uniform Plumbing Code as published by the Western Plumbing Officials Association, and applicable laws and regulations of the governing authorities.
- B. When the contract documents call for materials or construction of a better quality or larger size than required by the above-mentioned rules and regulations, provide the quality and size required by the contract documents.
- C. If quantities are provided either in these specifications or on the drawings, these quantities are provided *for information only*. It is the Contractor's responsibility to determine the actual quantities of all material, equipment, and supplies required by the project and to complete an independent estimate of quantities and wastage.

1.7 TESTING

- A. Notify the Owners' Representative three (3) days in advance of any testing.
- B. Pressure Test:
 - 1. Pipelines jointed with rubber gaskets or threaded connections may be subjected to a pressure test at any time after partial completion of backfill. Pipelines jointed with solvent-welded PVC joints shall be allowed to cure a minimum of 24 hours before testing. Pipelines installed with thrust blocks shall have the concrete cured for a minimum of seven (7) days before testing.
 - 2. Subsections of mainline pipe may be tested independently, subject to the review of the Owners' Representative.
 - 3. Furnish clean, clear water, pumps, labor, fittings, and all equipment necessary to

conduct tests or retests.

4. The test pressure shall not exceed the rated working pressure of the pipe.
 - a. Hydrostatic Pressure Test:
 - 1) Fill mainline pipe with water, purge all air out of the system. Subject mainline pipe to a hydrostatic pressure of 150 PSI for two hours. Test with mainline components installed. A 2 PSI pressure variation is allowed.
 - i. The use of an air compressor to provide pressure is not allowed.
 - 2) Fill lateral pipe with water, purge all air out of the system. Subject lateral pipe to a hydrostatic pressure of 75 PSI. Test with risers for sprinklers capped.
 - i. The use of an air compressor to provide pressure is not allowed.
 - 3) Backfill to prevent pipe from moving under pressure. Expose couplings and fittings.
 - 4) Leakage will be detected by visual inspection. Replace defective pipe, fitting, joint, valve, or appurtenance. Repeat the test until the pipe passes test.
 - i. Cement or caulking to seal leaks is prohibited.
 - 5) The Owners' Representative reserves the option to furnish the gauges and metering devices for the tests.

C. Operational Test:

1. Prior to the Operational Test connect and configure all system sensors.
 - a. The flow sensor shall be operational and operated per the manufacturer's instructions to learn the flow for all zones to be tested. The flow shall be stored in the controller's memory.
 - b. The master valve shall be installed and connected to the controller, and fully operational.
 - c. All rain, wind, temperature, weather or other sensors specified on the plan shall be installed, connected, and fully operational.
2. Activate each remote-control valve in sequence from controller. The Owners' Representative will visually observe operation, water application patterns, and leakage.
3. Replace defective remote-control valve, solenoid, wiring, or appurtenance to correct operational deficiencies.
4. Replace, adjust, or move water emission devices to correct operation or coverage deficiencies.
5. Replace defective pipe, fitting, joint, valve, sprinkler, or appurtenance to correct leakage problems.
6. Cement or caulking to seal leaks is prohibited.
7. Repeat test(s) until each lateral passes all tests.

8. The Owners' Representative will measure and record static and dynamic pressure at the point of connection and in the system mainline at various locations.
9. The Owner's Representative will measure and record dynamic pressure at various sprinklers and water emission devices.

1.8 CONSTRUCTION REVIEW

- A. The purpose of on-site reviews by the Owners' Representative is to periodically observe the work in progress and the Contractor's interpretation of the construction documents and to address questions with regards to the installation.
 1. Scheduled reviews such as those for irrigation system layout or testing should be scheduled with the Owners' Representative as required by these specifications.
 2. Impromptu reviews may occur at any time during the project.
 3. Final review will occur at the completion of the irrigation system and Record Drawing (As-Built) submittal.

1.9 GUARANTEE/WARRANTY AND REPLACEMENT

- A. The purpose of this guarantee/warranty is to ensure that the Owner receives irrigation materials of prime quality, installed and maintained in a thorough and careful manner.
 1. For a period of one year from commencement of the formal maintenance period, guarantee/warranty irrigation materials, equipment, and workmanship against defects. Fill and repair depressions. Restore landscape or structural features damaged by the settlement of irrigation trenches or excavations. Repair damage to the premises caused by a defective item. Make repairs within seven (7) days of notification from the Owners' Representative.
 2. Costs for all guarantee/warranty work shall be entirely paid for by the Contractor.
 3. Contract documents govern replacements identically as with new work. Make replacements at no additional cost to the contract price.
 4. Guarantee/warranty applies to originally installed materials and equipment and replacements made during the guarantee/warranty period.

PART 2 - MATERIALS

2.1 QUALITY

- A. Use materials that are new and without flaws or defects of any type and are the best of their class and kind.

2.2 SUBSTITUTIONS

- A. Pipe sizes referenced in the Construction Documents are minimum sizes and may be increased at the option of the Contractor. Substitutions in pressure class of pipe shall be approved by the Irrigation Designer.

2.3 IRRIGATION TAP AND WATER METER

- A. Provide materials required by local codes for installation of the municipal water tap and associated piping.

- B. Provide materials required by local code for installation of the water meter, vault and associated piping.

2.4 SLEEVING

- A. Install separate sleeve beneath paved areas to route each run of irrigation pipe or wiring bundle.
- B. Sleeving material beneath pedestrian pavements shall be PVC Class 200 bell end pipe with solvent welded joints.
- C. Sleeving beneath drives and streets shall be PVC Class 200 bell end pipe with solvent welded joints.
- D. Sleeving diameter: As indicated on the drawings and installation details or equal to twice the nominal diameter of the pipe or wiring bundle passing through.
 - 1. Furnish and install size sleeves for wiring bundles per the current NEC Conduit Fill calculations and charts.

2.5 PIPE AND FITTINGS

A. Mainline Pipe and Fittings:

- 1. Use rigid, unplasticized polyvinyl chloride (PVC) round pipe, National Sanitation Foundation (NSF) approved, extruded from material meeting the requirements of Cell Classification 12454 as defined in ASTM Standard D1784, with an integral belled end.
- 2. Use Class 200, SDR-21, rated at 200 PSI, conforming to the dimensions and tolerances established by ASTM Standard D2241 and ASTM Standard D2672. Use PVC pipe rated at higher pressures than Class 200 in the case of small nominal diameters which are not manufactured in Class 200.
 - a. Use solvent weld pipe for mainline pipe with a nominal diameter less than 3-inches or where a pipe connection occurs in a sleeve. Use Schedule 40/80, Type 1, Cell Classification 12454, PVC solvent weld fittings conforming to ASTM Standard D1784 and ASTM Standard D2466 (Schedule 40)/D2467 (Schedule 80). All belled end pipe shall have tapered sockets to create an interference type fit, which meet or exceed the dimensional requirements and minimum socket length for pressure type sockets as defined by ASTM Standard 2672. Use primer specifically approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564.

B. Lateral Pipe and Fittings:

- 1. Use rigid, unplasticized polyvinyl chloride (PVC) round pipe, National Sanitation Foundation (NSF) approved, extruded from material meeting the requirements of Cell Classification 12454 as defined in ASTM Standard D1784, with an integral belled end.
- 2. Use Class 200, SDR-21, rated at 200 PSI, conforming to the dimensions and tolerances established by ASTM Standard D2241. Use PVC pipe rated at higher pressures than Class 200 in the case of small nominal diameters that are not manufactured in Class 200. All belled end pipe shall have tapered sockets to create an interference type fit, which meet or exceed the dimensional requirements and

minimum socket length for pressure type sockets as defined by ASTM Standard 2672.

- a. Use Schedule 40/80, Type 1, Cell Classification 12454, PVC solvent weld fittings conforming to ASTM Standard D1784 and ASTM Standard D2466 (Schedule 40)/D2467 (Schedule 80).
- b. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564, of a type approved by the pipe manufacturer.
 - 1) Solvent welded pipe shall not be installed when the outside temperature drops below forty-five (45) degrees Fahrenheit.

C. Specialized Pipe and Fittings:

1. Copper pipe: Use Type K drawn temper (hard or rigid) copper pipe conforming to ASTM Standard B88.
 - a. Use wrought copper or cast bronze fittings that are dezincification resistant and conform to ASTM Standard B75, soldered or threaded per the installation details. Use a 95% tin and 5% antimony solder. Use a thread sealant approved by the pipe manufacturer.
2. Galvanized steel pipe: Use Schedule 40/80 conforming to ASTM Standard A123.
 - a. Use galvanized, threaded, Class 150, malleable iron fittings conforming to ASME Standard B16.3 and ASTM Standard A123.
3. Ductile iron pipe: Use ductile iron pipe with a minimum pressure class rating of 200 PSI and meeting the requirements of ANSI/AWWA Standard C151/A21.51 and ANSI/AWWA Standard C150/A21.50.
 - a. Use ductile iron fittings with a minimum pressure class rating of 200 PSI and meeting the requirements of ANSI/AWWA Standard C153/A21.53.
 - b. Rubber Gasket joints shall meet the requirements of ANSI/AWWA Standard C111/A21.11.
 - c. Install all ductile iron pipe in accordance with ANSI/AWWA Standard C600.
4. Use a dielectric union wherever a copper-based metal (copper, brass, bronze) is joined to an iron-based metal (iron, galvanized steel, stainless steel).
5. Assemblies calling for pre-fabricated swing joints shall utilize SPEARS swing joints or approved equal. Swing joints shall be rated at 315 psi, and use O-ring, Buttress thread and street elbow construction.
6. Inline Emitter Drip Tubing:
 - a. Provide a low volume dripper line with integral and evenly spaced pressure compensating drippers at specified intervals in a discharge rate of 0.6 gallons per hour (GPH). Inline Emitter Drip Tubing shall consist of nominal sized one-half inch low-density linear polyethylene tubing. The Inline Emitter Drip Tubing shall have internal pressure compensating, continuous self-cleaning, integral drippers at a specified spacing of 12" on center with a built-in check valve capable of holding up to 4.6/8.5 feet of water, or blank tubing without drippers where specified in detail.

- 1) Inside diameter: 0.57 inches
- 2) Outside diameter: 0.67 inches
- 3) Color: Brown/Black/Purple/Chartreuse
- b. Use spiral barb fittings supplied by the same manufacturer as the inline emitter drip tubing. Use tubing stakes supplied by the same manufacturer as the inline emitter drip tubing.
- c. All tubing shown outside of the bed area shall be Class 200 PVC pipe.
7. Low Density Polyethylene Hose:
 - a. Use pipe specifically intended for use as a flexible swing joint.
 - 1) Inside diameter: 0.490+0.010 inch
 - 2) Wall thickness: 0.100+0.010 inch
 - 3) Color: Black
 - 4) Pressure Rating: 80 PSI
 - b. Use spiral barb fittings supplied by the same manufacturer as the hose.
8. Assemblies calling for threaded pipe connections shall utilize PVC Schedule 80 nipples and PVC Schedule 80 threaded fittings.
9. Joint sealant:
 - a. Use only Teflon-type tape pipe joint sealant on plastic threads. Use nonhardening, nontoxic pipe joint sealant formulated for use on water-carrying pipes on metal threaded connections.
10. Marking Tape:
 - a. Mainline Pipe - Christy underground I.D. tape TA.DT.6.P.NPW.

2.6 MAINLINE COMPONENTS

- A. Main System Shutoff Valve: As per local practice and in compliance with local code.
- B. Winterization Assembly: As per local practice and in compliance with local code.
- C. Backflow Prevention Assembly: As presented in the installation details and in compliance with local code.
- D. Master Valve Assembly: As presented in the installation details.
- E. Flow Sensor Assembly: As presented in the installation details.
- F. Isolation Gate Valve Assembly: As presented in the installation details. Install a separate valve box over a 3-inch depth of 3/4-inch gravel for each assembly.
- G. Quick Coupling Valve Assembly: Double swing joint arrangement as presented in the installation details. Install at a height where key can be inserted, turned and valve pressurized without removing threaded handle.

2.7 SPRINKLER AND BUBBLER IRRIGATION COMPONENTS

- A. Remote Control Valve (RCV) Assembly for Sprinkler and Bubbler Laterals:

1. As presented in the installation details. Use wire connectors and waterproofing sealant to join control wires to solenoid valves. Use standard identifications tags marked with controller name and station number. Install a separate valve box over a 3-inch depth of washed pea gravel for each assembly. Use 8-ounce minimum weight non-woven geotextile fabric underneath pea gravel and box assembly to prevent dirt and debris intrusion. Adjust valve flow control per manufacturer's recommendations prior to use.
2. Sprinkler Assembly: As presented in the drawings and installation details.
3. Bubbler Assembly: As presented in the drawings and installation details.

2.8 DRIP IRRIGATION COMPONENTS

A. Remote Control Valve (RCV) Assembly for Drip Laterals:

1. As presented in the installation details. Use wire connectors and waterproofing sealant to join control wires to solenoid valves. Use standard identifications tags marked with controller name and station number. Install a separate valve box over a 3-inch depth of washed pea gravel for each assembly. Use 8-ounce minimum weight non-woven geotextile fabric underneath pea gravel and box assembly to prevent dirt and debris intrusion. Adjust valve flow control per manufacturer's recommendations prior to use.

B. Flush Cap Assembly

1. As presented in the installation details. Locate at the end of each drip irrigation lateral pipe. Install a separate valve box over a 3-inch depth of pea gravel for each assembly. Use 8-ounce minimum weight non-woven geotextile fabric underneath pea gravel and box assembly to prevent dirt and debris intrusion.

C. Drip Operation Indicator

1. As presented in the installation details. Install at the most remote dead ends of UV radiation resistant polyethylene tubing. Install in area easily accessible for maintenance and visibility. Minimum of 8-inch indicator pop up height.

2.9 CONTROL SYSTEMS COMPONENTS

A. Irrigation Controller Unit:

1. As presented in the drawings and installation details.
 - a. Rain Bird ESPLXMEF as manufactured by Rain Bird, Inc.
2. Controller Lightning protection: 8-foot copper-clad grounding rod.
3. Controller Lightning protection: 4" x 96" x 0.0625" copper-clad grounding plate.
4. Wire markers: Pre-numbered or labeled with indelible non-fading ink, made of permanent, non-fading material.

B. Instrumentation:

1. As presented in the drawings and installation details.
2. Rain Sensor: Rain Bird RSD as manufactured by Rain Bird, Inc.
3. Flow Sensor: QS200 as manufactured by Flomec, Inc.

C. Control Wire:

1. Use American Wire Gauge (AWG) No.12/14 solid copper conforming to ASTM B-3 or ASTM B-8. Type UF or PE cable, UL approved for direct underground burial from the controller unit to each remote-control valve. Use American Wire Gauge (AWG) No.12 wire for common wire.

a. Type PE Cable:

- 1) Minimum temperature rating of 60° C and 600 volts.
- 2) Minimum insulation thickness of 0.060”.
- 3) Sunlight resistant, testing at 300 hours of carbon-arc or xenon-arc exposure.
- 4) Cold Bend Test: Insulation shall not show any cracks when sample is bent around a 3X mandrel after being subjected to minus 25° C for four (4) hours.
- 5) Insulation shall not absorb more than 25mg mass of water per square inch.

b. Wire Color for Conventional Wire Controllers:

- | | |
|------------------------------|--------|
| 1) Common | White |
| 2) Turf | Green |
| 3) Wetland Garden Sprinklers | Orange |
| 4) Inline Drip | Yellow |
| 5) Bubblers | Red |
| 6) Spare Wires | Purple |

- D. Splices: Use wire connectors with waterproof sealant. Wire connector to be of UV radiation resist plastic construction consisting of two pieces, one piece which snap locks into the other. Connector shall be pre-filled with non-hardening silicone gel. Utilize twist style wire connector provided with assembly to connect wires.

1. Wire connectors to meet requirements of UL Standard 486D
2. Utilize DBR/Y-600 Black Splices
3. Encase wiring not located near PVC irrigation pipe in PVC Schedule 80 electrical conduit. Utilize long sweep elbows for changes of direction.

- E. Warning tape: Detectable Warning Tape reading “Caution: Buried Electrical Line Below” shall be inert plastic film highly resistant to alkalis, acids, or other destructive chemical components likely to be encountered in soils. Tape shall be six inches wide, colored red.

2.10 OTHER COMPONENTS

- A. Tools and Spare Parts: Provide operating keys, servicing tools, test equipment, other items and spare parts indicated in the General Notes of the drawings.

1. Additionally, provide the following:
2. Two operating keys for each type and size of manually operated valve.
3. Two keys for each type and size of quick coupler.

4. Two of each servicing wrench or tool needed for complete access, adjustment, installation of nozzles and repair of all spray, rotary and rotor type sprinklers.
 5. Two 3" diameter pressure gauges and associated fittings to measure system pressure and pressure at spray, rotary and rotor type sprinklers and remote-control valves. Pressure gauge shall have a range of 0-160 PSI.
 - a. Two sets of keys for each controller, enclosure or equipment that requires keyed access.
 6. If required, keys shall be keyed to match other locks that the Owner possess.
 - a. All instruction manuals, repair manuals, operating manuals and original paper work related to the products that were installed during construction of the irrigation system.
- B. Owner Stock: Include the following for owner stock for future replacements.
1. Five (5) of each type of spray and rotary sprinkler body.
 2. Ten (10) of each type, radius, arc, and nozzle of spray, rotary sprinkler and bubbler.
 3. Three (3) of each type of drip operation indicator.
 4. 100-foot continuous length of inline emitter drip tubing of each flow rate and inline emitter spacing.
 5. Ten (10) sets of waterproof connectors.
 6. Five (5) of each type and size of fitting; inline emitter, sprinkler, sprinkler lateral and mainline.

PART 3 - EXECUTION

3.1 INSPECTION AND REVIEWS

A. Site Inspections:

1. Verify site conditions and note irregularities affecting work of this section. Report irregularities to the Owners' Representative prior to beginning work.
2. Beginning work of this section implies acceptance of all existing conditions.
3. Contractor will be held responsible for coordination between landscape and irrigation system installation.
4. Landscape material locations shown on the Landscape Plan shall take precedence over the irrigation system equipment locations. If irrigation equipment is installed in conflict with the landscape material locations shown on the Landscape Plan, the Contractor will be required to relocate the irrigation equipment, as necessary, at Contractor's expense.

B. Utility Location (Call Before You Dig)

1. Arrange for and coordinate with local authorities the location of all underground utilities.
2. Repair any underground utilities damaged during construction. Make repairs at no additional cost to the contract price.

- C. Irrigation System Layout Review: Irrigation system layout review will occur after the staking has been completed. Notify the Owners' Representative three business days in advance of review. Modifications will be identified by the Owners' Representative at this review.

3.2 LAYOUT OF WORK

- A. Stake out the irrigation system. Adjust system layout from plans to conform to final approved landscape design. Items staked shall include: Sprinklers, pipe, control valves, manual drains, controller, and isolation valves, grounding locations and sleeving.
- B. Install all mainline pipe and mainline components inside of project property lines.

3.3 EXCAVATION, TRENCHING AND BACKFILLING

- A. Excavate to permit the pipes to be laid at the intended elevations and to permit work space for installing connections and fittings.
- B. Minimum cover (distance from top of pipe or control wire to finish grade):
 - 1. 24-inch over mainline pipe and over electrical conduit.
 - 2. 26-inch over control wire.
 - 3. 26-inch over signal wire.
 - 4. 18-inch over lateral pipe to sprinklers.
- C. Backfill only after lines have been reviewed and passed hydrostatic tests and accepted by the Owner.
 - 1. Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetable matter, frozen materials, and stones larger than 1/2-inch in maximum dimension. Remove material not suitable for backfill. Backfill placed next to pipe shall be free of sharp objects which may damage the pipe. All soil shall be screened and pass through a square opening 1/2" x 1/2".
 - 2. Backfill un-sleeved pipe and sleeves in either of the following manners:
 - a. Backfill and puddle the lower half of the trench. Allow to dry 24 hours. Backfill the remainder of the trench in 6-inch layers. Compact to density of surrounding soil.
 - b. Backfill the trench by depositing the backfill material equally on both sides of the pipe in 6-inch layers and compacting to the density of surrounding soil.
 - 3. Enclose pipe and wiring beneath roadways, walks, curbs, etc. in sleeves. Minimum compaction of backfill for sleeves shall be 95% Standard Proctor Density, ASTM D698-78. Conduct one compaction test for each sleeved crossing less than 50 feet long. Conduct two compaction tests for each sleeved crossing greater than 50 feet long. Costs for such testing and any necessary retesting shall be paid for by the Contractor. Use of water for compaction around sleeves, puddling, will not be permitted.
 - 4. Dress backfilled areas to original grade
 - 5. Where utilities conflict with irrigation trenching and pipe work, contact the Owners' Representative for trench depth adjustments.

3.4 SLEEVING AND BORING

- A. Install sleeving at a depth which permits the encased pipe or wiring to remain at the specified burial depth.
- B. Extend sleeve ends six inches beyond the edge of the paved surface. Cover pipe ends and mark with stakes. Mark concrete with a chiseled "X" at sleeve end locations.
- C. Bore for sleeves under obstructions which cannot be removed. Employ equipment and methods designed for horizontal boring.

3.5 ASSEMBLING PIPE AND FITTINGS

- A. General:
 1. Keep pipe free from dirt and pipe scale. Cut pipe ends square and deburr. Clean pipe ends.
 2. Keep ends of assembled pipe capped to prevent dirt and debris intrusion. Remove caps only when necessary to continue assembly.
- B. Mainline Pipe and Fittings:
 1. Use only strap-type friction wrenches for threaded plastic pipe. Tighten threaded plastic pipe per pipe and fitting manufacturers recommendations.
 2. PVC Solvent Weld Pipe:
 - 1) Use primer and solvent cement. Join pipe in a manner recommended by the manufacturer and in accordance with accepted industry practices.
 - 2) Cure for 30 minutes before handling and 24 hours before allowing water in pipe.
 - 3) Snake pipe from side to side within the trench.
 3. Fittings: The use of cross and wye type fittings is not permitted.
- C. Lateral Pipe and Fittings:
 1. Use only strap-type friction wrenches for threaded plastic pipe. Tighten threaded plastic pipe per pipe and fitting manufacturers recommendations.
 2. PVC Solvent Weld Pipe:
 - a. Use primer and solvent cement. Join pipe in the manner recommended by the manufacturer and in accordance with accepted industry practices.
 - b. Cure for 30 minutes before handling and 24 hours before allowing water in the pipe.
 - c. Snake pipe from side to side within the trench.
 3. Fittings: The use of cross and wye type fittings is not permitted.
- D. Specialized Pipe and Fittings:
 1. Copper Pipe:
 - a. Buff surfaces to be joined to a bright finish. Coat with solder flux.
 - b. Solder so that a continuous bead shows around the joint circumference.

2. Galvanized Steel Pipe:
 - a. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.
 - b. Use factory-made threads whenever possible. Field-cut threads will be permitted only where necessary. Cut threads on axis using clean, sharp dies.
 - c. Apply Teflon-type tape or pipe joint compound to the male threads only.
 3. Ductile Iron Pipe:
 - a. Use push-on joints whenever possible. Use pipe lubricant. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.
 4. Insert a dielectric union wherever a copper-based metal (copper, brass, bronze) and an iron-based metal (iron, galvanized steel, stainless steel) are joined.
 5. Pre-fabricated double swing joints: Install per manufacturer's recommendations.
 6. Low Density Polyethylene Hose: Install per manufacturer's recommendations.
 7. PVC Threaded Connections:
 - a. Use only factory-formed threads. Field-cut threads are not permitted.
 - b. Use only thread sealant recommended by pipe and fitting manufacturer.
 - c. When connection is plastic-to-metal, the plastic component shall have male threads and the metal component shall have female threads.
 8. Make metal-to-metal, threaded connections with Teflon-type tape or pipe joint compound applied to the male threads only.
- 3.6 INSTALLATION OF MAINLINE COMPONENTS
- A. Main System Shut Off Valve: Install where indicated on the drawings.
 - B. Winterization Assembly: Install where indicated on the drawings.
 - C. Backflow Prevention Assembly: Install where indicated on the drawings. Install assembly so that its elevation, orientation, access, and drainage conform to the manufacturer's recommendations and applicable health codes.
 - D. Master Valve Assembly: Install where indicated on the drawings.
 - E. Flow Sensor Assembly: Install where indicated on the drawings.
 - F. Isolation Gate Valve Assembly:
 1. Install where indicated on the drawings.
 2. Locate at least 12-inches from and align with adjacent walls or edges of paved areas.
 - G. Quick Coupling Valve Assembly: Install where indicated on the drawings.
- 3.7 INSTALLATION OF SPRINKLER IRRIGATION COMPONENTS
- A. Remote Control Valve (RCV) Assembly for Sprinkler Laterals:
 1. Flush mainline before installation of RCV assembly.

2. Install where indicated on the drawings. Wire connectors and waterproof sealant shall be used to connect control wires to remote control valve wires. Install connectors and sealant per the manufacturer's recommendations.
3. Install only one RCV to a valve box. Locate valve box at least 12-inches from and align with nearby walls or edges of paved areas. Group RCV assemblies together where practical. Arrange grouped valve boxes in rectangular patterns. Allow at least 12-inches between valve boxes.
4. Adjust RCV to regulate the downstream operating pressure.
5. Attach ID tag with controller station number to control wiring.

B. Sprinkler Assembly:

1. Flush lateral pipe before installing sprinkler assembly.
2. Install per the installation details at locations shown on the drawings.
3. Locate rotary sprinklers 6-inches from adjacent walls, fences, or edges of paved areas.
4. Locate spray sprinklers 3-inches from adjacent walls, fences, or edges of paved areas.
5. Set sprinklers perpendicular to the finish grade.
6. Supply appropriate nozzle or adjust arc of coverage of each sprinkler for best performance.
7. Adjust the radius of throw of each sprinkler for best performance.

3.8 INSTALLATION OF DRIP IRRIGATION COMPONENTS

A. Remote Control Valve (RCV) Assembly for Drip Laterals

1. Flush mainline pipe before installing RCV assembly.
2. Locate as shown on the drawings. Wire connectors and waterproof sealant shall be used to connect control wires to remote control valve wires. Connectors and sealant shall be installed as per the manufacturer's recommendations.
3. Install only one RCV to valve box. Locate at least 12-inches from and align with nearby walls or edges of paved areas. Group RCV assemblies together where practical.
4. Arrange grouped valve boxes in rectangular patterns.

B. Drip Emitter Assembly:

1. Locate as shown on the drawings and installation details.
2. Flush tubing grid after installation and before installing flush valve.
3. Cut emitter outlet distribution tubing square.
4. Install an access sleeve as part of each multiple-outlet emitter assembly for emitters located in turf areas.
5. Use tools and techniques recommended by the manufacturer. Make openings for barb-mounted emitters with the emitter manufacturer's hole-punching tool.

- C. Flush Cap Assembly: Install at the end of each drip irrigation lateral pipe as shown on the installation details.

3.9 INSTALLATION OF CONTROL SYSTEM COMPONENTS

A. Irrigation Controller Unit:

1. The location of the controller unit as depicted on the drawings is approximate; the Owners' Representative will determine the exact site location upon commencement of contract. during sprinkler layout review.
2. Lightning protection: Ground rods are to have a minimum diameter of 3/4" and a minimum length of 10 feet. These are to be driven into the ground in a vertical position or an oblique angle not to exceed 15 degrees at location 10 feet from the electronic equipment, the ground plate, or the wires and cables connected to said equipment, as shown in the irrigation details. The rod is to be stamped with the UL logo. A 6 AWG solid bare copper wire (no more than 12 feet long) shall be connected to the ground rod by the installer using a Cadweld GR1161G" One-Shot" welding kit. This wire shall be connected to the electronic equipment ground lug as shown in the detail above.
3. Attach wire markers to the ends of control wires inside the controller unit housing. Label wires with the identification number (see drawings) of the remote-control valve to which the control wire is connected.
4. Connect control wires to the corresponding controller terminal.

B. Instrumentation:

1. Install sensors per the installation details and manufacturer's recommendations. Install at locations shown on the drawings.
2. Install electrical connections between irrigation controller and sensors per manufacturer's recommendations.

C. Control Wire:

1. Bundle control wires where two or more are in the same trench. Bundle with pipe wrapping tape spaced at 10-foot intervals.
2. Provide a 24-inch excess length of wire in an 8-inch diameter loop at each 90-degree change of direction, at both ends of sleeves, and at 100-foot intervals along continuous runs of wiring. Make wiring loop by turning control wire 5 turns around 1-inch pipe. Coil 24-inch length of wire within each remote-control valve box.
3. Install common ground wire and one control wire for each remote-control valve. Multiple valves on a single control wire are not permitted.
4. If a control wire must be spliced, make splice with wire connectors and waterproof sealant, installed per the manufacturer's instructions. Locate splice in a valve box which contains an irrigation valve assembly, or in a separate 6-inch round valve box. Use same procedure for connection to valves as for in-line splices.
5. Unless noted on plans, install wire parallel with and under PVC mainline pipe. If wire is installed adjacent to section of metal pipe, separate wire from pipe minimum of 6-inches and install wire in PVC conduit.
6. Encase wire not installed with PVC mainline pipe in electrical conduit.

- D. Warning tape: Detectable Warning Tape shall be installed approximately 6 inches above mainline pipe where required or where specified.

3.10 INSTALLATION OF OTHER COMPONENTS

A. Tools and Spare Parts:

1. Prior to the Pre-Maintenance Review, supply to the Owner operating keys, servicing tools, test equipment, and any other items indicated on the drawings.
2. Prior to Final Review, supply to the Owner the spare parts indicated in the General Notes on the drawings.

- B. Other Materials: Install other materials or equipment shown on the drawings or installation details to be part of the irrigation system, even though such items may not have been referenced in these specifications.

3.11 PROJECT RECORD (AS-BUILT) DRAWINGS

- A. Maintain on-site and separate from documents used for construction, one complete set of contract documents as Project Documents. Keep documents current. Do not permanently cover work until as-built information is recorded.

- B. Record pipe and wiring network alterations. Record work which is installed differently than shown on the construction drawings. Record accurate reference dimensions, measured from at least two permanent reference points, of each irrigation system valve, each backflow prevention device, each controller or control unit, each sleeve end, each stub-out for future pipe or wiring connections, and other irrigation components enclosed within a valve box.

- C. Prior to Final Review, purchase from the Owners' Representative a reproducible mylar copy of the drawings. Using technical drafting pen, duplicate information contained on the project drawings maintained on site. Label each sheet "Record Drawing". Completion of the Record Drawings will be a prerequisite for the Final Review.

3.12 MAINTENANCE

- A. Upon completion of Final Review, maintain irrigation system for a duration of 30 calendar days. Make periodic examinations and adjustments to irrigation system components to achieve the most desirable application of water.

- B. Following completion of the Contractor's maintenance period, the Owner will be responsible for maintaining the system in working order during the remainder of the guarantee/warranty period, for performing necessary minor maintenance, for trimming around sprinklers, for protecting against vandalism, and for preventing damage during the landscape maintenance operation.

3.13 CLEAN-UP

- A. Upon completion of work, remove from the site all machinery, tools, excess materials, and rubbish.

3.14 INITIAL STARTUP AND WINTERIZATION

- A. Contractor shall be responsible for the initial startup of the system after final acceptance and the first year winterization of the system.

3.15 TRAINING

- A. Contractor shall be responsible for training a maximum of three people chosen by the owner in the operation of the complete irrigation system, including but not limited to the irrigation pump, controller, cistern refill system, control valves, sprinklers and drip tubing.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Irrigation System will be measured at the unit price per lump sum for the complete system tested in place
- 4.2 All necessary permits and fees, excavation, backfill, concrete, and all other incidental materials will not be measured for payment
- 4.3 The cost of cistern, pump, backflow preventer, controller, control valves, wiring, sprinklers, bubblers, drip tubing, piping, sleeves and other miscellaneous items necessary for a complete installation will not be measured for payment and shall be included in the cost of Irrigation System.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Irrigation System shall be paid for at the unit price per lump sum for the complete system tested in place.
- 5.2 The cost of any necessary permits and fees, excavation, backfill, concrete, and all other incidental materials shall be included in the cost of Irrigation System
- 5.3 The cost of cistern, pump, backflow preventer, controller, control valves, wiring, sprinklers, bubblers, drip tubing, piping, sleeves and other miscellaneous items necessary for a complete installation will not be measured for payment and shall be included in the cost of Irrigation System.
- 5.4 Payment will be made under:

Pay Item

Pay Unit

Irrigation System

LUMP SUM

- 5.5 This price and payment will be full compensation for furnishing the pay item noted above. The cost of all incidental materials and work required for a complete system tested in place shall be included in the cost of the pay item.

END OF SECTION 32 8400

SECTION 32 8440 - CISTERN PUMP AND TANK

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the one (1) cistern pump system, and guarantee/warranty as shown on the drawings, the installation details, and as specified herein. Items of work specifically included are:
- B. Procurement of all applicable licenses and permits.
- C. Connection of electrical power to the irrigation pumping plant equipment.
- D. Procurement and installation of prefabricated pumping system for water feature
- E. Procurement and installation of piping and valves for pump system operation

1.2 WORK NOT INCLUDED

- A. Items of work specifically excluded or covered under other sections are:
- B. Installation of electric services, meters, and electrical disconnect and distribution panel.

1.3 RELATED WORK

- A. Irrigation
- B. Structural
- C. Electrical
- D. Earthwork

1.4 SUBMITTALS

- A. Materials List: Include pipe, fittings, and control system components. Quantities of materials need not be included.
- B. Manufacturers' Data: Submit manufacturers' catalog cuts, specifications, and operating instructions for equipment shown on the materials list.
- C. Shop Drawings: Submit shop drawings of the pump station installation. Show products required for proper installation, their relative locations, and critical dimensions. Note modifications to the installation detail. Coordinate with pump station building shop drawings.

1.5 GUARANTEE/WARRANTY AND REPLACEMENT

- A. The purpose of this guarantee/warranty is to insure that the Owner receives irrigation materials of prime quality, installed and maintained in a thorough and careful manner.

- B. For a period of one year from the date of final completion and commencement of the formal maintenance period, guarantee/warranty irrigation materials, equipment, and workmanship against defects. Fill and repair depressions. Restore landscape or structural features damaged by the settlement of trenches or excavations. Repair damage to the premises caused by a defective item. Make repairs within seven days of notification for the Construction Manager's Representative.
- C. Contract documents govern replacements the same as new work. Make replacements at no cost in contract price.
- D. Guarantee/warranty applies to originally installed materials and equipment and replacements made during the guarantee/warranty period.

PART 2 - MATERIALS

2.1 CISTERN PUMPING SYSTEM

- A. General:
 - 1. The equipment covered by these Specifications is intended to be standard pumping equipment of proven ability as manufactured by a manufacturer having long experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed as shown on the Drawings. The pumps shall be manufactured by Zoeller.
 - 2. The equipment shall be installed as shown on the drawings. If equipment is provide with connections different than that shown on the drawings, the Contractor shall provide the necessary fittings and components to provide a workable system as approved by the Owner.
 - 3. Brass or stainless steel nameplates giving the name of the Manufacturer, the rated capacity, head, speed, serial number, model number, horsepower, voltage, amperes and all other pertinent data shall be attached to each pump.
 - 4. The nameplate ratings for the motors shall not be exceeded at any point on the pump curve, nor shall the design service factor be reduced when its pump is operating at any point on its characteristic curve at maximum speed. The pump curve shall have a continuously rising head along the entire curve to shut-off head.
- B. Submersible Pumps
 - 1. General
 - a. The sump pumps shall be heavy duty submersible type with impellers designed to handle solids. The pump shall be installed in pre-cast concrete wet well as shown on the Drawings.
 - 2. Performance Requirements:
 - a. The submersible pumps shall bed designed and manufactured as specified for the following conditions of service:

1. Discharge size: 1.25-inches
 2. Capacity: 17 GPM at 70 PSI
 3. Motor horsepower: 1.5 HP
 - b. Impeller shall be bronze of solids-handling type
 - c. Casing shall be Cast Iron ASTM A-48
 - d. Pump shall be rated for 240V/3-Phase power
 - e. Pump model shall be Munro model MXS205T22, no approved equal will be accepted for this project.
- C. Piping:
1. Fabricated Piping:
 - a. Galvanized steel pipe: Use Schedule 40/80 conforming to ASTM Standard A123.
 - b. All welding flanges shall be forged steel, 150 lb. slip on or welding neck type, conforming to ASTM Specification A181, Grade 1.
 - c. All welding fittings shall be seamless, conforming to ASTM Specification A234, with the same pressure rating as the piping.
 2. Pump Check Valves:
 - a. The pump discharge check valves shall be of the center pivot dual disc non-slam type. The valves shall have either cast-iron or steel bodies and Buna N sealing members. The trim shall be bronze and stainless steel. Each valve shall mount directly to each pump discharge head flange.
 - b. Pump check valve model: Zoeller 6030-0180
 3. Isolation Valves:
 - a. The isolation valves shall be resilient wedge gate valve
 1. Gate valves shall be rated at minimum 200 psi working pressure.
 2. Gate valves shall be manufactured by Matco, or approved equal.
 3. Install gate valves below grade in Carson 910 round valve box below grade
 4. Tools and Spare Parts
 - a. One set of all special tools required for normal operation and maintenance shall be provided by manufacturer
- D. Electrical and Controls:
1. Electrical Control Panels:
 - a. The pumping station electrical controls shall be mounted in a self-containing NEMA 3R enclosure. The electrical panel doors shall be constructed from 12-gauge steel with integral latches.
 - b. All external operating devices shall be dust and weatherproof. Operating handles for each pump disconnect circuit breaker shall be provided in the

- front of the panel doors. Reset buttons for each starter overload relay shall be located in each starter panel door.
- c. All internal components of the panels shall be mounted on removable back pans. Mounting screws for components shall not be tapped into the panel enclosure.
 - d. All internal wiring within, and interconnecting between, the panels shall be complete and no field wiring within the panels shall be required.
 - e. No pressure gauges, pressure switches, water activated devices, or water lines of any sort shall be installed in any electrical control panel.
2. Motor Starters: Pump motor starters shall be circuit breaker combination type with 120 volt operating coils. Overload relays shall be ambient compensating type installed on each power let and shall be set to trip at 105% of motor full-load current rating. The design shall include a differential mechanism for sensitivity to single phase conditions.
3. Master Control and Display Panel:
- a. General:
 1. The master control and display panel shall be appropriate NEMA 3R enclosure separate from the high voltage control panel and fabricated from not less than 14-gauge steel and equipped with a non-yellowing, impact-resistant, Lexan-glazed, gasketed enclosure door. The door shall have a draw-tight screw latch. The incoming power shall be isolated by means of a circuit breaker or fused disconnect.
 2. The pump sequence controller shall be an industrial grade, multi-function microprocessor, field programmable, and equipped with light emitting diodes for diagnostic and monitoring purposes. The controller shall receive inputs from a flow sensor and pressure transducer located on the discharge manifold.
 3. Provide lightning and surge protection for programmable controller.
 - b. Control system equipment shall conform to the National Electrical Code Standards.
 - c. Variable frequency drive:
 1. Variable Frequency Drive (VFD) Inverter:
 - a) The variable frequency drive shall include, terminals for incoming power, motor output power and various control terminals. Front operator stations are included with output frequency meter, speed adjustment, fault indications and run/stop switch.
 - b) The VFD inverter maintains maximum station efficiency by varying pump rotational speed to meet the demands of the system. Variable frequency pulse width modulated (PWM) AC power shall be supplied by the inverter to achieve the variable pump speed.

- c) Inverter will have under voltage, over voltage and over current protection. The VFD shall include an incoming circuit breaker, incoming main starting contractor and motor protection device. Inverter shall follow a speed signal or manual speed adjustment. Control power shall be 120 VAC. Front panel devices will include a frequency meter, speed adjustment, fault indicator, and hand-off-auto selector switch. Inverter shall have adjustments for acceleration and deceleration, V/F adjustment, and voltage boost.
- d. Manual Override:
 - 1. In the event of VFD drive failure, the pump shall be capable of manual operation by means of a bypass starter circuit.
- e. The variable frequency drive inverter panel shall be cooled with a water to air heat exchanger and fan. The heat exchanger shall be capable of maintaining a temperature of 90°F inside the panel with an ambient temperature of 120°F with the VFD operating at full load. The heat exchanger shall be thermostatically controlled.
 - 1. Switches and Displays: The control panel shall be equipped with the following switches and displays:
 - a) Manual on/off selector switches with green (run) and red (safety shut down) indicator lamps.
 - b) Individual pump elapsed time meters.
- f. National Electrical Code Standards: The control systems equipment shall conform to the National Electrical Code Standards.
- g. Main Station Circuit Breaker Disconnect: A three pole main station disconnect circuit breaker shall be mounted in the high voltage control panel to completely isolate the electrical system from the incoming power. The disconnect breaker shall conform to the requirements of the National Electrical Code and any applicable local code. The main station disconnect breaker shall have an operating handle on the front of the panel.
- h. Pump Motor Running Time Meter(s): Each pump motor starter shall be equipped with an elapsed time meter reading up to 9999.9 hours in tenths of hours. The meter(s) shall be installed in the NEMA 4x electrical control cabinet.
- i. Corrosion Inhibiting Modules: Corrosion inhibiting modules shall be installed in all electrical enclosures in accordance with the manufacturer's recommendations. The corrosion inhibitor shall be a Hoffman Engineering Model HC110E, or equal.

2.2 CISTERN STORAGE TANK

A. MANUFACTURERS:

1. Acceptable Manufacturer: Xerxes Corporation, which is located at: 7901 Xerxes Ave. S.; Minneapolis, MN 55431; Tel: 952-887-1890; Fax: 952-887-1882; Email:info@xerxes.com; Web:www.xerxes.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600 - Product Requirements.

2.3 UNDERGROUND WATER TANKS

- A. Tank Design - Fiberglass reinforced plastic (FRP) tanks:
 1. The tank size, fittings and accessories shall be as shown on the drawings.
 2. Tank shall be manufactured with structural ribs which are fabricated as in integral part of the tank wall.
 3. Tank shall be manufactured with a laminate consisting of resin and glass fiber reinforcement only. No sand/silica fillers or resin extenders shall be used.
 4. Tank shall be vented to atmospheric pressure.
 5. Tank shall be capable of handling liquids with specific gravity up to 1.1
 6. Tank shall be compatible with liquids identified in the manufacturer's standard limited warranty.
- B. Loading Conditions - Tank shall meet the following design criteria:
 1. Internal Load - Tank shall be designed to withstand a 5-psig (35 kPa) air-pressure test with a 5:1 safety factor.
 2. Surface Loads - Tank shall be designed to withstand surface H-20 and HS-20 axle loads when properly installed according to manufacturer's current Installation Manual and Operating Guidelines.
 3. External Hydrostatic Pressure - Tank shall be designed for 7 feet (2.1 m) of overburden over the top of the tank, the hole fully flooded, and a safety factor of 5:1 against general buckling.

PART 3 - EXECUTION

3.1 INSTALLATION OF CISTERN PUMPING SYSTEM

- A. Prefabricated Pump Station:
 1. Install where indicated on the drawings.
 2. Installation shall be in strict accordance with the Manufacturer's instructions and recommendations in the locations shown on the Drawings. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the Manufacturer's recommendations.
 3. Supply all anchor bolts, power, water, labor, and all other incidentals required for the proper installation of the pumps.
- B. Tank: Tank shall be installed according to the tank manufacturer's Installation Manual and Operating Guidelines in effect at time of installation.

- C. Operation and Maintenance Manuals: The manufacturer shall provide three sets of Operation and Maintenance Manuals to the Construction Manager's Representative.
- D. On-Site Start Up: Technical start up shall be furnished by the pump station manufacturer. Location and mounting details shall be furnished by the pump manufacturer. Electrical connection shall consist of a single conduit from existing disconnect to the pump station main disconnect.
- E. Technical start up procedures by the pump station manufacturer shall include the following:
 - 1. Station start up and pressurization.
 - a. Pressure, flow and programming adjustments.
 - b. Monitoring of water feature performance.

3.2 INSTALLATION OF OTHER COMPONENTS

- A. Tools and Spare Parts:
 - 1. Prior to the Substantial Completion, supply to the Owner operating keys, servicing tools, test equipment, and any other items indicated on the drawings.
- B. Other Materials: Install other materials or equipment shown on the drawings or installation details to be part of the irrigation system, even though such items may not have been referenced in these specifications.

3.3 PROJECT RECORD DRAWINGS

- A. Prior to Substantial Completion, obtain from the Construction Manager's Representative a reproducible Mylar copy of the Drawings. Using technical drafting pen, duplicate information contained on the Record Drawings maintained on site.
- B. Label each sheet "Record Drawing". On the first sheet, the Contractor or resident superintendent shall execute the following statement:
- C. Having reviewed this document and all attachments, I affirm that, to the best of my knowledge, the information presented here is true and accurate.

Signed: _____ Date _____

Position: _____

- D. Record pipe and wiring network alterations. Record work which is installed differently than shown on the construction drawings. Record accurate reference dimensions, measured from at least two permanent reference points

3.4 CLEANUP

- A. Upon completion of work, remove from the site all machinery, tools, excess materials, and rubbish.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Cistern Pump and Tank will be measured at the unit price per lump sum for the complete system tested in place
- 4.2 All necessary permits and fees, excavation, backfill, concrete, and all other incidental materials will not be measured for payment
- 4.3 The cost of cistern, pump, tank, controller, filter, wiring, and other miscellaneous items necessary for a complete installation will not be measured for payment and shall be included in the cost of Cistern Pump and Tank.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Cistern Pump and Tank shall be paid for at the unit price per lump sum for the complete system tested in place.
- 5.2 The cost of any necessary permits and fees, excavation, backfill, concrete, and all other incidental materials shall be included in the cost of Irrigation System
- 5.3 The cost of cistern, pump, tank, controller, filter, wiring, and other miscellaneous items necessary for a complete installation will not be measured for payment and shall be included in the cost of Cistern Pump and Tank.
- 5.4 Payment will be made under:

Pay Item

Pay Unit

Cistern Pump and Tank

LUMP SUM

- 5.5 This price and payment will be full compensation for furnishing the pay item noted above. The cost of all incidental materials and work required for a complete system tested in place shall be included in the cost of the pay item.

END OF SECTION 32 8440

SECTION 329113 - SOIL PREPARATION

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 planting soils specified by composition of the mixes.
- B. Related Requirements:
 - 1. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
 - 2. Section 329300 "Plants" for placing planting soil for plantings.

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- B. CEC: Cation exchange capacity.
- C. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- D. Imported Soil: Soil that is transported to Project site for use.
- E. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- F. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.
- G. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
- H. Planting Soil: Existing, on-site soil; amended on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth, including modifying soil chemistry, texture and drainage; and further defined in this specification.
- I. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
- J. SSSA: Soil Science Society of America.

- K. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
 - L. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
 - M. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
 - N. Topsoil: Naturally produced and harvested soil from the A horizon or upper layers or the soil as further defined in this specification.
 - O. USCC: U.S. Composting Council.
- 1.4 PREINSTALLATION MEETINGS
- A. Preinstallation Conference: Conduct conference at Project site.
- 1.5 ACTION SUBMITTALS
- A. Product Data: For each type of product.
 - 1. Include recommendations for application and use.
 - 2. Include test data substantiating that products comply with requirements.
 - 3. Include sieve analyses for aggregate materials.
 - 4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:
 - a. Manufacturer's qualified testing agency's certified analysis of standard products.
 - b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
 - c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
- 1.6 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For each testing agency.
 - B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.
 - C. Field quality-control reports.
- 1.7 QUALITY ASSURANCE

- A. **Installer Qualifications:** The Contractor shall engage a qualified landscape subcontractor who has completed soil preparation work similar in material, design and extent to that indicated for this Project, with 5 years minimum experience in finish grading work, and with a record of successful landscape establishment. The Contractor shall require landscape subcontractor to maintain an experienced full-time supervisor on the Project site during times that soil preparation work and planting operations are in progress.
- B. **Testing Agency Qualifications:** An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
 - 1. **Laboratories:** Subject to compliance with requirements, provide testing by the following:
 - a. A&L Great Lakes Laboratories. 3505 Conestoga Drive, Fort Wayne, Indiana 46808. 260-483-4759. www.algreatlakes.com.
 - b. Approved Equal.

1.8 PRECONSTRUCTION TESTING

- A. **Preconstruction Testing Service:** Engage a qualified testing agency to perform preconstruction soil analyses on imported soil.
 - 1. Notify Architect seven days in advance of the dates and times when laboratory samples will be taken.
- B. **Preconstruction Soil Analyses:** For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
 - 1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.9 SOIL-SAMPLING REQUIREMENTS

- A. **General:** Extract soil samples according to requirements in this article.
- B. **Sample Collection and Labeling:** Have samples taken and labeled by state-certified, -licensed, or -registered soil scientist under the direction of the testing agency.
 - 1. **Number and Location of Samples:** Minimum of five representative soil samples from varied locations for each soil to be used or amended for landscaping purposes.
 - 2. **Procedures and Depth of Samples:** According to USDA-NRCS's "Field Book for Describing and Sampling Soils."
 - 3. **Division of Samples:** Split each sample into two, equal parts. Send half to the testing agency and half to Owner for its records.
 - 4. **Labeling:** Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.10 TESTING REQUIREMENTS

- A. **General:** Perform tests on soil samples according to requirements in this article.

- B. Physical Testing:
1. Soil Texture: Soil-particle, size-distribution analysis by the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
 - a. Hydrometer Method: Report percentages of sand, silt, and clay.
 2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
 3. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
 4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D 698 (Standard Proctor).
- C. Chemical Testing:
1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
 2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."
 3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
 4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.
- D. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAFT, including the following:
1. Percentage of organic matter.
 2. CEC, calcium percent of CEC, and magnesium percent of CEC.
 3. Soil reaction (acidity/alkalinity pH value).
 4. Buffered acidity or alkalinity.
 5. Nitrogen ppm.
 6. Phosphorous ppm.
 7. Potassium ppm.
 8. Manganese ppm.
 9. Manganese-availability ppm.
 10. Zinc ppm.
 11. Zinc availability ppm.
 12. Copper ppm.
 13. Sodium ppm and sodium absorption ratio.
 14. Soluble-salts ppm.
 15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
 16. Other deleterious materials, including their characteristics and content of each.
- E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."

- F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
 - 1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. for 6-inch depth of soil.
 - 2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. for 6-inch depth of soil.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Do not move or handle materials when they are wet or frozen.
 - 4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

1.12 PROJECT CONDITIONS

- A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand-excavate, as required. Contractor shall be responsible for damages and repairs as a result of failure to locate utilities.

PART 2 - PRODUCTS

2.1 SOILS

- A. TOPSOIL
 - 1. Topsoil Source: Import topsoil from off-site local sources. Obtain topsoil from naturally well-drained local or regional sites, where topsoil occurs at least 4 inches deep; topsoil shall not be obtained from bogs or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants. Provide source information for topsoil as required in this specification. Source area for topsoil shall not have been under active cultivation for a period of 5 years minimum or from a commercial processing facility specializing in production of sands, gravels and stones.
 - 2. Topsoil shall be natural, fertile, friable, and pervious soil. Topsoil shall be black or a darker shade of brown than underlying subsoil and clean and free of stones 1 inch or larger in any dimension, roots, plants, sods, clay lumps, brush, weeds and other extraneous materials harmful to plant growth. Topsoil shall not be pulverized. Topsoil shall comply with ASTM D 5268.
 - 3. Topsoil shall meet the following composition.

Mechanical Analysis:	Loam or Sandy Loam	
pH Range:	6.0-7.0	
Organic Matter Content:	Minimum 6% and maximum 15%	
Chemical Analysis:	Magnesium:	100-250 ppm and 10-15% base saturation
	Phosphorus:	P1 (weak Bray) 20-30 ppm P2 (strong Bray) 40-60 ppm
	Potassium:	175-250 ppm and 5-20% base saturation
	Calcium:	1600 ppm and 65-75% base saturation
	Soluble Salts:	Shall not exceed .75 mmhos/cm

4. Topsoil will be considered defective if it does not pass tests and meet the above composition. Contractor shall remove and legally dispose of defective topsoil and replace with suitable topsoil at no additional cost to the Owner.

B. PLANTING SOIL

1. Imported approved topsoil that has been modified with specified soil amendments and fertilizers to produce a soil mixture best for plant growth. Amend topsoil as follows:
 - a. Ratio of Loose Compost to Soil: 1:4 by volume.
 - b. Ratio of Loose Sphagnum Muck Peat to Soil: as recommended by analysis.
 - c. Weight/Volume of inorganic soil amendments: as recommended by analysis.
 - d. Weight/Volume of fertilizers: as recommended by analysis.
2. Blend approved topsoil with compost and amendments as recommended by analysis to create Planting Soil.
3. Approved Products:
 - a. PM6 Mix, as provided by Greendell Landscape Solutions (greendelllandscandscape.com), 749 West State Road 42, Mooresville, IN 46158, Phone (888) 237-7331.
 - b. Or approved Equal.

C. PLANTER SOIL MIX

1. Professional Growing Mix, PGM56, as provided by Greendell Landscape Solutions (greendelllandscandscape.com), 749 West State Road 42, Mooresville, IN 46158, Phone (888) 237-7331.
2. Or approved Equal.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime:** ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.
 2. Form: Provide lime in form of ground dolomitic limestone.

- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Perlite: Horticultural perlite, soil amendment grade.
- E. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.
- F. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
 - 1. Feedstock: food, or biosolids; or source-separated or compostable mixed solid waste.
 - 2. Reaction: pH of 5.5 to 8.
 - 3. Soluble-Salt Concentration: Less than 5 dS/m.
 - 4. Moisture Content: 35 to 55 percent by weight.
 - 5. Organic-Matter Content: 50 to 60 percent of dry weight.
 - 6. Particle Size: Minimum of 98 percent passing through a 3/4-inch sieve.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1-inch sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture with 100 percent passing through a 1/2-inch sieve, a pH of 6 to 7.5, a soluble-salt content measured by electrical conductivity of maximum 5 dS/m, having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.

2.4 FERTILIZERS

- A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

PART 3 - EXECUTION

3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.

- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
 - C. Prior to placing planting soil, the Contractor shall remove all excessively compacted subsoil, hardpan, stone or gravel used for roads, parking, access, or base and return the subgrade to a condition approximating natural subsoil.
 - D. Do not place topsoil before subgrade elevations have been inspected by Architect.
 - E. Proceed with placement only after unsatisfactory conditions have been corrected.
- 3.2 PLACING MANUFACTURED PLANTING SOIL OVER EXPOSED SUBGRADE
- A. General: Apply manufactured soil on-site in its final, blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
 - B. Subgrade Preparation: Till subgrade to a minimum depth of 6 inches. Remove stones larger than 1-inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply approximately half the thickness of planting soil over prepared, loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.
 - C. Application: Spread planting soil to total depth of 6 inches in lawn areas and 12 inches in plant beds, but not less than required to meet finish grades after natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
 - 1. Lifts: Apply planting soil in lifts not exceeding 8 inches in loose depth for material compacted by compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
 - D. Compaction: Once final grade has been approved by the Architect, compact soil sufficiently such that a standard 1" soil sampling tube meets at least 15 pounds of resistance when inserted into the soil. Compaction should only be sufficient so that it will show a shallow heel mark when walked upon and will allow water to penetrate at a rate of 1" per hour. Over compaction will require remediation as directed by the Architect.
 - E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- 3.3 FIELD QUALITY CONTROL
- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
 - B. Perform the following tests:
 - 1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 2000 sq. ft. of in-place soil or part thereof.

2. Repeat soil analysis testing as defined in article 1.10 “Testing Requirements” to verify that all requirements are met.
- C. Soil will be considered defective if it does not pass tests.
- D. Prepare test reports.
- E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.4 PROTECTION

- A. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
 1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Vehicle traffic.
 4. Foot traffic.
 5. Erection of sheds or structures.
 6. Impoundment of water.
 7. Excavation or other digging unless otherwise indicated.
- B. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

3.5 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Planting Soil will be measured at the unit price per Cubic Yard.
- 4.2 Planter Soil will be measured at the unit price per Cubic Yard.
- 4.3 All excavation, earthwork, backfill, aggregate, water, testing, engineering, consulting, incidental materials, and work necessary for a complete installation of Planting Soil and Planter Soil will not be measured for payment.

PART 5 - BASIS OF PAYMENT

SOIL PREPARATION

- 5.1 The cost of Planting Soil shall be paid for at the unit price per Cubic Yard.
- 5.2 The cost of Planter Soil shall be paid for at the unit price per Cubic Yard.
- 5.3 All excavation, earthwork, backfill, aggregate, water, testing, engineering, consulting, incidental materials, and work necessary for a complete installation of Planting Soil shall be included in the cost of the pay item Planting Soil and Planter Soil.
- 5.4 Payment will be made under:
- A.

<u>Pay Item</u>	<u>Pay Unit</u>
Planting Soil	CUBIC YARD
Planter Soil	CUBIC YARD
- 5.5 This price and payment will be full compensation for furnishing all pay items noted above.

END OF SECTION 32 9113

SECTION 32 9200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sodding.
- B. Related Requirements:
 - 1. Section 32 9115 "Soil Preparation (Performance Specification)" for definitions, testing requirements, and installation of planting soil in sodded areas.
 - 2. Section 32 9300 "Plants" for trees, shrubs, ground covers, and other plants.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 32 9115 "Soil Preparation (Performance Specification)" and drawing designations for planting soils.
- E. Reasonable and reasonably: When used in this specification relative to turf quality, it is intended to mean that the conditions cited will not affect the establishment or long-term stability, health, or growth of the turfgrass. This specification recognizes that it is not possible to produce turf free of all defects, but that some accepted industry protocols and standards result in turf unacceptable to this project. When reasonable or reasonably is used in relation to other issues such as weeds, disease, and insects, it shall mean at levels low enough that no treatment would be required when applying recognized Integrated Plant Management practices. This specification recognizes that some decisions cannot be totally based on measured findings and that professional judgement

is required. In cases of differing opinion, the Landscape Architect shall determine when conditions are judged as reasonable.

- F. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - 1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
- C. Product Certificates: For fertilizers, from manufacturer.
- D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
 - 1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
 - 2. Experience: Five years' experience in turf installation in addition to requirements in Section 01 4000 "Quality Requirements."
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the National Association of Landscape Professionals:
 - a. Landscape Industry Certified Technician - Exterior.
 - b. Landscape Industry Certified Lawn Care Manager.
 - c. Landscape Industry Certified Lawn Care Technician.
 - 5. Pesticide Applicator: State licensed, commercial.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.

1.9 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: March 15 – May 14.
 - 2. Summer Planting: May 15 – September 14, with approval of Owner and Architect. Supplemental watering will be required.
 - 3. Fall Planting: September 15 – October 31.
 - 4. Planting between November 1 and March 14 is not permitted.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.10 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse or neglect by Owner.
 - 2. Warranty Periods: From date of Substantial Completion.
 - a. All turf areas: 24 months.
 - 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead turf and replace unless required to plant in the succeeding planting season.
 - b. Provide extended warranty for period equal to original warranty period, for replaced turf material.

PART 2 - PRODUCTS

2.1 TURFGRASS SOD

- A. Turfgrass Sod: Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.
- B. Turfgrass Species, Cool-Season Grass: Sod of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Sun and Partial Shade:
 - a. Proprietary Turf Blue® HGT® (Healthy Grass Technology) Bluegrass Sod with five bluegrass varieties.
 - 2. ***Tall fescue (Festuca sp.) and associated cultivars will not be permissible per Table 04-18 "Prohibited Plant Species", Chapter 20.04.080 "Landscaping, Buffering, and Fences, City of Bloomington, Indiana's Unified Development Ordinance, current edition.***
- C. Thickness of Cut: Turfgrass shall be machine cut at uniform soil thickness of 0.60 (15mm) plus or minus 0.25 inch (6mm), at the time of cutting. Measurement for thickness shall exclude top growth and thatch.
- D. Pad Size: Individual pieces of turfgrass sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus 0.5 inch (13mm) on width and plus or minus five percent on length. Broken pads and torn or uneven ends will not be acceptable.
- E. Strength of Turf Sod Sections: Standard size sections of turfgrass sod shall be strong enough that it can be picked up and handled without damage.

- F. Moisture Content: Turfgrass sod shall not be harvested or transplanted when its moisture content (excessively dry or wet) may adversely affect its survival.
- G. Mowing Height: Before harvesting, the turfgrass shall be mowed uniformly at a height of 1 to 2.5 inches (25 to 60mm).
- H. Time Limitation: Turfgrass sod shall be harvested, delivered and installed/transplanted within a period of 24 hours, unless a suitable preservation method is approved prior to delivery. Turfgrass sod not transplanted within this period shall be inspected and approved by the Owner or Landscape Architect prior to its installation.
- I. Disease and Insects: Turfgrass sod shall be reasonably free of disease, nematodes, and soil-borne insects.

2.2 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition:
 - a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition:
 - a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 3. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 32 9115 "Soil Preparation (Performance Specification)."
- B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.
 - 1. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across slopes exceeding 1:3.
 - 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.5 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow turf-type tall fescue to a height of 2 to 3 inches.
- D. Turf Postfertilization: Apply commercial fertilizer after initial mowing and when grass is dry.
 - 1. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.6 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
 - 1. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.7 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.8 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

3.9 MAINTENANCE SERVICE

- A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:
 - 1. Basic Maintenance Period: **One year** from date of Substantial Completion.
 - 2. Extended Maintenance Period: **One year** starting at the completion of the Basic Maintenance Period.
 - a. Contractor shall provide a maintenance bond for these services.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Turf, Sod will be measured at the unit price per Square Foot.
- 4.2 Extended Maintenance Period, Sod will be measured at the unit price per LUMP SUM.
- 4.3 All excavation, earthwork, backfill, aggregate, water, mowing, basic maintenance period, herbicides, pesticides, fertilizers, turf grass, incidental materials, and work necessary for a complete installation of Sod will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Turf, Sod shall be paid for at the unit price per Square Foot.
- 5.2 Extended Maintenance Period, Sod shall be paid for at the unit price per LUMP SUM.
- 5.3 The cost of all excavation, earthwork, backfill, aggregate, water, mowing, basic maintenance period, herbicides, pesticides, fertilizers, turf grass, incidental materials, and work necessary for a complete installation of Sod shall be included in the cost of the pay item Sod.

5.4 Payment will be made under:

A. <u>Pay Item</u>	<u>Pay Unit</u>
Turf, Sod	SQUARE YARD
Extended Maintenance Period, Sod	LUMP SUM

5.5 This price and payment will be full compensation for furnishing all pay items noted above.

END OF SECTION 32 9200

SECTION 32 9300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Plants.
 - 2. Native Plugs.
 - 3. Tree stabilization.
 - 4. Tree-watering devices.
 - 5. Landscape edgings.
 - 6. Paver grate installation..
- B. Related Requirements:
 - 1. Section 01 5639 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
 - 2. Section 32 3300 "Site Furnishings" for exterior planters.
 - 3. Section 32 9115 "Soil Preparation" for definitions, testing requirements, and installation of planting soil in planted areas.
 - 4. Section 32 9200 "Turf and Grasses" for turf (lawn), and erosion-control materials.

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Basal Wound: A wound at the base of a tree.
- D. Branch Flagging: A dead branch on a live tree with dying or dead foliage attached.
- E. Caliper: Diameter of trunk measured 6 inches from the ground; if caliper is greater than 4 inches, the caliper measurement is taken at 12 inches from the ground.

- F. Central Leader: A continuation of the main trunk located more or less in the center of the crown. Beginning at the lowest main branch and extending to the top of the tree. Also referred to as the dominant leader.
- G. Check: A longitudinal fissure in wood resulting from stresses that causes wood fibers to separate along the grain.
- H. Co-dominant stems: Two or more tree stems of equal size that are joined at the base or partway up the bole.
- I. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- J. Crook: An abrupt bend in a tree trunk or root.
- K. Crotch Angle: The angle formed at the attachment between two stems.
- L. Crown: The upper part of any tree carrying the main branches and foliage.
- M. Cultivar: An assemblage of cultivated plants which is clearly distinguished by any characters (morphological, physiological, cytological, chemical, or others), and which when reproduced, retains its distinguishing characters.
- N. Decay: Any feature, fault, or flaw that lowers the strength, integrity, or utility of an affected part.
- O. Defective Plant: Any plant that fails to meet the plant quality requirement of this specification.
- P. Finish Grade: Elevation of finished surface of planting soil.
- Q. Healthy: Plants that are growing in a condition that expresses leaf size, crown density, color, and with annual growth rates typical of the species and the cultivar's horticultural description, adjusted for the planting soil, drainage, and local weather conditions.
- R. Included Bark or Embedded Bark (EB): Included bark occurs when bark is included into the attachment between two stems, preventing the joining of wood tissue in the area between the stems. Included bark attachments always have an extremely narrow angle between the stems, resembling the letter "V" (rather than the letter "U" or "L: typical in strong attachments). As stems having included bark increase in size, pressure is exerted from the stem expansion and a crack often develops in the crotch between the stems. Included bark attachments have a higher potential for failure in later years.
- S. Mitigation: Actions that may be taken to reduce, minimize, or eliminate the potential risk posed by a tree hazard.

- T. Native Plant Plugs: Healthy, vigorous, well-rooted plants grown in removable containers or integral peat pots with a well-established root system reaching the sides of the container and maintaining a firm root mass when removed from the container. Containers shall be in accordance with ANSI Z60.1 for type and size of plant required.
- U. Necrosis: Death of a plant or a plant part; usually referring to localized death of living tissues of a host.
- V. Normal: The prevailing protocol of industry standard(s).
- W. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.
- X. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- Y. Planting Area: Areas to be planted.
- Z. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 32 9115 "Soil Preparation (Performance Specification)" for drawing designations for planting soils.
- AA. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- BB. Reasonable and reasonably: When used in this specification relative to plant quality, it is intended to mean that the conditions cited will not affect the establishment or long-term stability, health, or growth of the plant. This specification recognizes that it is not possible to produce plants free of all defects, but that some accepted industry protocols and standards result in plants unacceptable to this project. When reasonable or reasonably is used in relation to other issues such as weeds, disease, and insects, it shall mean at levels low enough that no treatment would be required when applying recognized Integrated Plant Management practices. This specification recognizes that some decisions cannot be totally based on measured findings and that professional judgement is required. In cases of differing opinion, the Landscape Architect shall determine when conditions are judged as reasonable.
- CC. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

- DD. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- EE. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- FF. Variety: A naturally occurring subdivision of a species or a group of plants within a species that has unique characteristics.
- GG. Wound: Any injury that usually breaks the bark of branches, stems, or roots of a shrub and serves as a possible entry point for fungi. Old wounds may become sealed with new bark and eventually hidden. Scars are wounds that have been sealed by callus (wound wood).

1.4 COORDINATION

- A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 - 2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
- B. Samples for Verification: For each of the following:
 - 1. Trees and Shrubs: Three Samples of each variety and size delivered to site for review. Maintain approved Samples on-site as a standard for comparison.
 - 2. Weed Control Barrier: 12 by 12 inches.
 - 3. Proprietary Root-Ball-Stabilization Device: One unit.
 - 4. Slow-Release, Tree-Watering Device: One unit of each size required.
 - 5. Tree Grates, Frames, and Accessories: Manufacturer's standard size delivered to site for review, to verify design selected.
 - 6. Root Barrier: Width of panel by 12 inches.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- B. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
- C. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
 - 1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
 - 2. Experience: Five years' experience in landscape installation in addition to requirements in Section 01 4000 "Quality Requirements."
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the National Association of Landscape Professionals or Indiana Nursery and Landscape Association:
 - a. Landscape Industry Certified Technician - Exterior.
 - b. Landscape Industry Certified Horticultural Technician.
 - c. Indiana Accredited Horticulturist (IAH).
 - 5. Pesticide Applicator: State licensed, commercial.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
 - 1. Architect reserves the right to select and tags plants at their place of growth before they are prepared for transplanting.
- C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
 - 1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
 - 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

- D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
 - 1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.
- C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- D. Handle planting stock by root ball.
- E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- G. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 - 1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 2. Do not remove container-grown stock from containers before time of planting.
 - 3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.11 FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: March 15 – May 31.
 - 2. Summer Planting: June 1 – September 14. Supplemental irrigation measures will be required.
 - 3. Fall Planting: September 15 – November 15.
 - 4. Acceptable planting times depend on plant species, type of stock, climate, and weather.
 - 5. If special conditions exist that warrant a variance in the above planting dates, a written request shall be submitted by the Contractor to the Architect stating the special conditions and the proposed variance. Permission for the variance will be granted at the discretion of the Owner/Architect.
 - 6. The contractor shall be responsible for coordinating digging of balled and burlapped stock in order to meet the Project's completion date.
- C. Plug Planting Restrictions: Plant during one of the following periods. Methods of installation will vary according to the time of the year. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. 1. Lowland and Aquatic Areas: Plugs planted in lowland, aquatic, or bio-retention areas shall be installed when soils and hydric conditions are favorable during growing season. Installation between March 15 and September 30 is preferred. Supplemental irrigation is mandatory for quick growth if natural weather patterns do not deliver 1 inch of rain per week.
 - 2. 2. Planting during any other time of the year must be submitted in writing to the Architect for review and approval.
- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse or neglect by Owner.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization and tree grates.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Periods: From date of Substantial Completion.

- a. Trees, Shrubs, Vines, and Ornamental Grasses: 24 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 24 months.
 - c. Annuals: Three months.
3. Include the following remedial actions as a minimum:
- a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.
- E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

- F. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 NATIVE PLUGS

- A. Source Limitation: Obtain native seed from single source from single supplier whenever possible.
 - 1. Plugs shall be obtained from a licensed nursery that has experience handling native plants.
 - 2. Local genotype plugs shall be used whenever possible due to its adaptation to local soil and climate.
 - 3. Native plugs shall be true to species. No hybrids or cultivars may be included.
 - 4. Plugs should be obtained from sources within the same EPA Level III Ecoregion as the project site. If the desired species are not available from the same ecoregion, seek materials from an adjacent region preferably to the west or east.
- B. Native Plant Plugs shall be a minimum of 2 1/4 inch square with 3 3/4 inch deep open-bottom pots. Plugs shall be thoroughly rooted through the container. Plant foliage shall be well developed, healthy, viable, and adequately hardened off for outdoor planting.
 - 1. Plugs shall be inoculated with VAM (Vesicular Arbuscular Mycorrhizae) endomycorrhizal fungi at the nursery.
 - 2. Plugs must be delivered to the planting site with adequate soil moisture, and be free of disease, mold, infestations, or other defects.

2.3 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1. Type: Shredded hardwood.
 - 2. Size Range: 3 inches maximum, 1/2 inch minimum.
 - 3. Color: Natural.

2.4 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.

2.5 PESTICIDES

- A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.6 TREE-STABILIZATION MATERIALS

- A. Trunk-Stabilization Materials:
 - 1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
 - 2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or compression springs.
 - 3. Guys and Tie Wires: ASTM A641/A641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.
 - 4. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
 - 5. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.
- B. Root-Ball Stabilization Materials:
 - 1. Proprietary Root-Ball Stabilization Devices: Proprietary at- or below-grade stabilization systems to secure each new planting by root ball and that do not encircle the trunk; sized according to manufacturer's written recommendations unless otherwise indicated.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following: Better Bilt Products, Inc.; Root Ball Anchor Kit. MacLean Power Systems; Duckbill Rootball Fixing System. Platipus Anchors Ltd.; Plati-mat®

Root Ball Fixing System. Tree Stake Solutions LLC; Root Anchor
Underground Tree Support.

2.7 TREE-WATERING DEVICES

- A. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents over an extended time period; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.
1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following: BIO-PLEX; 25-gallon Tree Ring (Regular). Engineered Watering Solutions; PQ Partners, LLC; 25-gallon Ooze Tube. Spectrum Products, Inc.; 20-gallon Treegator (Original). Color: As selected by Architect from manufacturer's full range.

2.8 MISCELLANEOUS PRODUCTS

- A. Root Barrier: Black, molded, modular panels 18 inches high (deep), 85 mils thick, and with vertical root deflecting ribs protruding 3/4 inch out from panel surface; manufactured with minimum 50 percent recycled polyethylene plastic with UV inhibitors.
- B. Burlap: Non-synthetic, biodegradable.
- C. Planter Filter Fabric: Nonwoven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.
- D. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
 3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

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

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 32 9115 "Soil Preparation (Performance Specification)."
- B. Placing Planting Soil: Place and mix planting soil in-place over exposed subgrade.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate according to manufacturer's written recommendations.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.
 1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 2. Excavate approximately three times as wide as ball diameter for balled and burlapped and container-grown stock.
 3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.

6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 7. Maintain supervision of excavations during working hours.
 8. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
 9. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
1. Hardpan Layer: Drill 6-inch-diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
1. Backfill: Planting soil. For trees, use excavated soil for backfill.
 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Continue backfilling process. Water again after placing and tamping final layer of soil.

- D. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
 - 1. Backfill: Planting soil. For trees, use excavated soil for backfill.
 - 2. Carefully remove root ball from container without damaging root ball or plant.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Continue backfilling process. Water again after placing and tamping final layer of soil.

- E. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.
- C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.7 TREE STABILIZATION

- A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:
 - 1. Upright Staking and Tying:
 - a. Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled

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- excavation and to extend one-third of trunk height above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
- b. Stake trees with two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.
2. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
 3. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
- B. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure each new planting by the root ball unless otherwise indicated.
1. Proprietary Root-Ball Stabilization Device: Install root-ball stabilization system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.
- 3.8 INSTALLATION OF NATIVE PLANT PLUG
- A. A. General: Native Plant Plugs shall be installed directly after erosion control devices have been installed.
 - B. Stakes shall be set to mark the planting zones and areas, and shall be reviewed by the Architect prior to planting.
 - C. Use an auger or other appropriate tool to excavate planting holes the same diameter and depth as the plug on 1 foot centers in a staggered pattern.
 - D. Plant plugs level with existing soil grade. Be certain that soil is placed around the plugs and firmed into place. Do no fill around plugs with mulch.
 - E. Spread mulch to a depth of two inches across the planted area.
 - F. Thoroughly soak plugged area with water until soil is moist to a depth of 4 inches
- 3.9 Native Plug Performance Standards
- A. A. General: Native Plugs shall meet the following criteria as determined by the Architect:
 1. 1. Final Acceptance and Warranty Period: At the end of one full growing seasons, the following conditions must be met:
 - a. Vegetated Coverage: A minimum of 95% of each planted area shall be vegetated.
 - b. Presence of Natives: At least 90% of the native species specified must be present as live plants.
 - c. Plugs shall exhibit vigorous growth and be thoroughly rooted.
- 3.10 INSTALLATION OF ROOT BARRIER

- A. Install root barrier where trees are planted within 60 inches of paving or other hardscape elements, such as walls, curbs, and walkways, unless otherwise indicated on Drawings.
- B. Align root barrier vertically with bottom edge angled at 20 degrees away from the paving or other hardscape element, and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.
- C. Install root barrier continuously for a distance of 60 inches in each direction from the tree trunk, for a total distance of 10 feet per tree. If trees are spaced closer, use a single continuous piece of root barrier.
 - 1. Position top of root barrier according to manufacturer's written recommendations.
 - 2. Overlap root barrier a minimum of 12 inches at joints.
 - 3. Do not distort or bend root barrier during construction activities.
 - 4. Do not install root barrier surrounding the root ball of tree.

3.11 PLACING SOIL IN PLANTERS

- A. Fill planter with planting soil. Place soil in lightly compacted layers to an elevation of 1-1/2 inches below top of planter, allowing natural settlement.

3.12 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.13 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 36-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
 - 2. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.14 INSTALLATION OF EDGING

- A. Shovel-Cut Edging: Separate mulched areas from turf areas with a 45-degree, 4- to 6-inch-deep, shovel-cut edge as indicated on Drawings.

3.15 FABRICATION OF TREE GRATES

- A. The Contractor shall submit two sets of shop drawings of the suspended pavement tree grates that clearly identify materials, sizes, general layout, finishes, and how the frame is anchored to the Architect for review prior to fabrication and purchase.
- B. Fabricate tree grate to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- C. The tree grates shall be fabricated true to line and level with accurate angles and surfaces and shall fit together with uniform joints and spacing. The tree grates shall be flat and free from shrinkage, distortion, warping or other defects.
- D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- F. Cope components at connections to provide a close fit or use fittings designed for this purpose. Weld all around at connections, including at fittings. Remove flux immediately.

3.16 INSTALLATION OF PAVER GRATES

- A. The Contractor shall not begin the installation of the suspended pavement type tree grates until the tree planting pit has been prepared, the trees have been planted and reviewed with the Architect. The Contractor who installs the suspended pavement type tree grates shall notify the Engineer of unsatisfactory preparation of tree planting pit before proceeding.
- B. Tree Grates: Install according to manufacturer's written instructions. Set grate segments flush with adjoining surfaces. Shim from supporting substrate with soil-resistant plastic. Maintain a 3-inch-minimum growth radius around base of tree; break away portions of casting, if necessary, according to manufacturer's written instructions.
- C. The concrete shall be flat and leveled so that the grates do not rock or appear unstable before the unit pavers are set. If necessary the Contractor shall grind the surrounding concrete ledge to create a uniform level surface to prevent the grate from rocking.

- D. The Contractor shall verify that the suspended pavement type tree grates are set at an elevation to ensure that the unit pavers supported by the paver suspension system are flush and level with the surrounding unit pavers.
- E. The tree grates shall be positioned so that all of the sections meet in the center of the tree well and have uniform spacing. Once the grates are positioned install the necessary hardware in order to secure the grates in place.
- F. The Contractor shall verify that the manufacturer has provided drainage holes in the bottom of the tray before installing setting bed or pavers. Drill a minimum of five equally spaced holes.
- G. The Contractor shall place and compact the asphalt setting bed in accordance with the paver special provision in the bottom of the tree grate as a leveling course for the pavers.
- H. Cut unit pavers to fit in the tree grate and around the tree opening ensuring a secure fit against the frame of the tree grate.

3.17 INSTALLATION OF SLOW-RELEASE WATERING DEVICE

- A. Provide one device for each tree.
- B. Place device on top of the mulch at base of tree stem and fill with water according to manufacturer's written instructions.

3.18 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.19 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

- B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.20 REPAIR AND REPLACEMENT

- A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
 - 1. Provide new trees of same size as those being replaced for each tree of 6 inches or smaller in caliper size.
 - 2. Species of Replacement Trees: Same species being replaced.

3.21 CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.
- E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.22 MAINTENANCE SERVICE

- A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
 - 1. Basic Maintenance Period: **One year** from date of Substantial Completion.
 - 2. Extended Maintenance Period: **One year** starting at the completion of the Basic Maintenance Period.
 - a. Contractor shall provide a maintenance bond for these services.

- B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
 - 1. Basic Maintenance Period: **One year** from date of Substantial Completion.
 - 2. Extended Maintenance Period: **One year** starting at the completion of the Basic Maintenance Period.
 - a. Contractor shall provide a maintenance bond for these services.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Deciduous Tree, Single Stem, 1.25" to 2" will be measured at the unit price per EACH.
- 4.2 Deciduous Tree, Single Stem, Over 2" to 2.5" will be measured at the unit price per EACH.
- 4.3 Deciduous Tree, Single Stem, Over 2.5" to 3.5" will be measured at the unit price per EACH.
- 4.4 Deciduous Tree, Multi-Stem, 96" to 120" will be measured at the unit price per EACH.
- 4.5 Deciduous Shrub, 18" to 24" will be measured at the unit price per EACH.
- 4.6 Coniferous, Broad Spreading will be measured at the unit price per EACH.
- 4.7 Plant, Perennial (#1) will be measured at the unit price per EACH.
- 4.8 Plant, Ornamental Grass (#1) will be measured at the unit price per EACH.
- 4.9 Plant, Ground Cover will be measured at the unit price per EACH.
- 4.10 Plant, Annual (32-cell Flat) will be measured at the unit price per EACH.
- 4.11 Mulch, Hardwood will be measured at the unit price per CUBIC YARD.
- 4.12 Landscape Edge, Spade will be measured at the unit price per LINEAL FOOT.
- 4.13 Landscape Edge, Steel will be measured at the unit price per LINEAL FOOT.

- 4.14 Dry Stream Bed will be measured at the unit price per SQUARE FOOT.
- 4.15 Extended Maintenance Period, Plants will be measured at the unit price per LUMP SUM.
- 4.16 All excavation, earthwork, backfill, aggregate, water, trimming, pruning, staking, basic maintenance period, metal edging, herbicides, pesticides, fertilizers, incidental materials, and work necessary for a complete installation of the respective pay items will not be measured for payment.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Deciduous Tree, Single Stem, 1.25" to 2" shall be paid for at the unit price per EACH.
- 5.2 The cost of Deciduous Tree, Single Stem, Over 2" to 2.5" shall be paid for at the unit price per EACH.
- 5.3 The cost of Deciduous Tree, Single Stem, Over 2.5" to 3.5" shall be paid for at the unit price per EACH.
- 5.4 The cost of Deciduous Tree, Multi-Stem, 96" to 120" shall be paid for at the unit price per EACH.
- 5.5 The cost of Deciduous Shrub, 18" to 24" shall be paid for at the unit price per EACH.
- 5.6 The cost of Coniferous, Broad Spreading shall be paid for at the unit price per EACH.
- 5.7 The cost of Plant, Perennial (#1) shall be paid for at the unit price per EACH.
- 5.8 The cost of Plant, Ornamental Grass (#1) shall be paid for at the unit price per EACH.
- 5.9 The cost of Plant, Ground Cover shall be paid for at the unit price per EACH.
- 5.10 The cost of Plant, Annual (32-cell Flat) shall be paid for at the unit price per EACH.
- 5.11 The cost of Mulch, Hardwood shall be paid for at the unit price per CUBIC YARD.
- 5.12 The cost of Landscape Edge, Spade shall be paid for at the unit price per LINEAL FOOT.
- 5.13 The cost of Landscape Edge, Steel shall be paid for at the unit price per LINEAL FOOT.
- 5.14 The cost of Dry Stream Bed shall be paid for at the unit price per SQUARE FOOT.
- 5.15 Extended Maintenance Period, Plants shall be paid for at the unit price per LUMP SUM.
- 5.16 The cost of all excavation, earthwork, backfill, aggregate, water, trimming, pruning, staking, basic maintenance period, metal and plastic edging, herbicides, pesticides, fertilizers, incidental materials, and work necessary for a complete installation shall be included in the cost of the respective pay items of which they are a part of.

5.17 Payment will be made under:

A. <u>Pay Item</u>	<u>Pay Unit</u>
Deciduous Tree, Single Stem, 1.25" to 2"	EACH
Deciduous Tree, Single Stem, Over 2" to 2.5"	EACH
Deciduous Tree, Single Stem, Over 2.5" to 3.5"	EACH
Deciduous Tree, Multi-Stem, 96" to 120"	EACH
Deciduous Shrub, 18" to 24"	EACH
Coniferous, Broad Spreading	EACH
Plant, Perennial (#1)	EACH
Plant, Ornamental Grass (#1)	EACH
Plant, Ground Cover	EACH
Plant, Annual (32-cell Flat)	EACH
Mulch, Hardwood	CUBIC YARD
Landscape Edge, Spade	LINEAL FOOT
Landscape Edge, Steel	LINEAL FOOT
Dry Stream Bed	SUARE FOOT
Extended Maintenance Period, Plants	LUMP SUM

5.18 This price and payment will be full compensation for furnishing all pay items noted above.

END OF SECTION 32 9300

SECTION 33 1413 - PUBLIC WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe and fittings for public line, including potable water line, and fire water line,.
 - 2. Tapping sleeves and valves.
 - 3. Valves and hydrants.
 - 4. Pipe support systems.
 - 5. Bedding and cover materials.
- B. Related Requirements:
 - 1. 2020 Construction Specifications City of Bloomington Utilities.
 - 2. Section 03 3000 - Cast-in-Place Concrete: Concrete for reinforcing steel, cradles and encasements.
 - 3. Section 31 2000 - Earth Moving: Soils and aggregates for backfill in trenches.
 - 4. Section 33 1415 - Site Water Distribution Piping: Water main service connections and meters.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment.

1.3 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Society of Mechanical Engineers:
 - 1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
- C. ASTM International:
 - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
 - 4. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³).
 - 5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³).
 - 6. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - 7. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 - 8. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

9. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
 10. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- D. American Water Works Association:
1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
 2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
 3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
 4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 5. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.
 7. AWWA C153 - Ductile-Iron Compact Fittings.
 8. AWWA C200 - Steel Water Pipe, 6 In. (150 mm) and Larger.
 9. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipe.
 10. AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. (100 mm) and Larger - Shop Applied.
 11. AWWA C206 - Field Welding of Steel Water Pipe.
 12. AWWA C207 - Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
 13. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings.
 14. AWWA C213 - Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings.
 15. AWWA C300 - Reinforced Concrete Pressure Pipe, Steel-Cylinder Type.
 16. AWWA C301 - Prestressed Concrete Pressure Pipe, Steel-Cylinder Type.
 17. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
 18. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.
 19. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
 20. AWWA C606 - Grooved and Shouldered Joints.
 21. AWWA C700 - Cold-Water Meters - Displacement Type, Metal Alloy Main Case.
 22. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
 23. AWWA C702 - Cold-Water Meters - Compound Type.
 24. AWWA C707 - Encoder-Type Remote-Registration Systems for Cold-Water Meters.
 25. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution.
 26. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service.
 27. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution.
 28. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.
- E. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP-60 - Connecting Flange Joints between Tapping Sleeves and Tapping Valves.
- F. National Fire Protection Association:
1. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

- G. NSF International:
 - 1. NSF 61 - Drinking Water System Components - Health Effects.
 - 2. NSF 372 - Drinking Water System Components - Lead Content.

- 1.4 COORDINATION
 - A. Section 01 3000 - Administrative Requirements: Requirements for coordination.
 - B. Coordinate Work of this Section with termination of water main connection at Site boundary, connection to municipal water utility service, and trenching.

- 1.5 PREINSTALLATION MEETINGS
 - A. Section 01 3000 - Administrative Requirements: Requirements for preinstallation meeting.
 - B. Convene minimum one week prior to commencing Work of this Section.

- 1.6 SUBMITTALS
 - A. Section 01 3300 - Submittal Procedures: Requirements for submittals.
 - B. Product Data: Submit manufacturer information regarding pipe materials, pipe fittings, valves, hydrants, and tapping sleeves.
 - C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 - D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
 - E. Qualifications Statements:
 - 1. Submit qualifications for manufacturer and installer.

- 1.7 CLOSEOUT SUBMITTALS
 - A. Section 01 7000 - Execution and Closeout Requirements: Requirements for submittals.
 - B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
 - C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

- 1.8 QUALITY ASSURANCE
 - A. Valves: Mark valve body with manufacturer's name and pressure rating.
 - B. Materials in Contact with Potable Water: Certified according to NSF 61 and NSF 372.
 - C. Perform Work according to 2020 Construction Specifications City of Bloomington Utilities standards.
 - D. Maintain one copy of each standard affecting Work of this Section on Site.

- 1.9 QUALIFICATIONS
 - A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

- B. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience in installation of liner materials.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 6000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Storage:
 - 1. Store materials according to manufacturer instructions.
 - 2. Block individual and stockpiled pipe lengths to prevent moving.
 - 3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
 - 4. Store PE and PVC materials out of sunlight.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

1.11 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

1.12 WARRANTY

- A. Section 01 7000 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish five-year manufacturer's warranty for valves, hydrants and tapping sleeves.

PART 2 - PRODUCTS

2.1 WATER PIPING

- A. Ductile-Iron Pipe:
 - 1. Comply with AWWA C151.
 - 2. Bituminous Outside Coating: Comply with AWWA C151.
 - 3. Pipe Mortar Lining:
 - a. Comply with AWWA C104.
 - b. Thickness: Double.
 - 4. PE Encasement: Comply with AWWA C105.
 - 5. Pipe Class:
 - a. Comply with AWWA C151.
 - b. Class 54.
 - 6. Fittings:
 - a. Material: Ductile iron; comply with AWWA C110.
 - b. Compact Fittings: Comply with AWWA C153.
 - c. Coating and Lining:
 - 1) Bituminous Coating: Comply with AWWA C110.
 - 2) Cement-Mortar Lining: Comply with AWWA C104; double thickness.
 - 7. Joints:

- a. Mechanical and Push-on Joints: Comply with AWWA C111.
 - b. Flanged Joints: Comply with AWWA C115.
 - c. Restrained Joints: Boltless, push-on type, joint restraint independent of joint seal.
8. Jackets: PE; comply with AWWA C105.
- B. PVC:
1. Comply with AWWA C900, Class 305.
 2. Fittings: Comply with AWWA C900.
 3. Joints:
 - a. Comply with ASTM D3139.
 - b. Seals: PVC flexible elastomeric.
 - c. Solvent-cement couplings are not permitted.

2.2 TAPPING SLEEVES AND VALVES

- A. Tapping Sleeves:
1. Manufacturers:
 - a. Furnish materials according to 2020 Construction Specifications City of Bloomington Utilities standards.
 2. Description:
 - a. Material: Ductile iron.
 - b. Type: Dual compression.
 - c. Outlet Flange Dimensions and Drilling: Comply with ASME B16.1, Class 125, and MSS SP-60.
- B. Tapping Valves:
1. Manufacturers:
 - a. Furnish materials according to 2020 Construction Specifications City of Bloomington Utilities standards.
 2. Description:
 - a. Comply with AWWA C509.
 - b. Type: Double disc with non-rising stem.
 - c. Inlet Flanges: Comply with ASME B16.1, Class 125, and MSS SP-60.
 - d. Mechanical Joint Outlets: Comply with AWWA C111.

2.3 VALVES

- A. Performance and Design Criteria:
1. Pressure Rating:
 - a. 12-inch Diameter and smaller: 200 psig.
 2. End Connections: Mechanical Joint.
 3. Coatings:
 - a. Comply with AWWA C550.
- B. Resilient-Wedge Gate Valves:
1. Furnish materials in compliance with 2020 Construction Specifications City of Bloomington Utilities standards.
 2. Description:
 - a. Comply with AWWA C509.
 - b. Body: Ductile Iron.
 - c. Seats: Resilient.
 - d. Stem:
 - 1) Type: Non-rising.

- 2) Material: Bronze.
- e. Operation:
 - 1) Square operating nut.
 - 2) Opening Direction: Counterclockwise.

2.4 FIRE HYDRANTS

- A. Manufacturers:
 - 1. Furnish materials in compliance with 2020 Construction Specifications City of Bloomington Utilities standards.
- B. Dry-Barrel, Breakaway Type:
 - 1. Comply with AWWA C502
 - 2. Body: Cast Iron.
 - 3. Valve: Compression-type.
 - 4. Inlet Connection Size: 6 inches.
 - 5. Valve Opening: 5-1/4 inches in diameter.
 - 6. End Connection: Mechanical joint.
 - 7. Bolts and Nuts: Bronze.
 - 8. Interior Coating: Comply with AWWA C550.
 - 9. Opening Direction: Open left or right.
- C. Hose Connections:
 - 1. One pumper, two hose nozzles.
 - 2. Obtain thread type and size from local fire department.
 - 3. Attach nozzle caps by separate chains.
- D. Finishes:
 - 1. Primer and two coats of enamel recommended by manufacturer.
 - 2. Color: Comply with requirements of 2020 Construction Specifications City of Bloomington Utilities standards.

2.5 VALVE BOXES

- A. Manufacturers:
 - 1. Furnish materials according to 2020 Construction Specifications City of Bloomington Utilities standards.
- B. Description:
 - 1. 12-inch Diameter Valves and Smaller:
 - a. Material: Casiron.
 - b. Type: Two piece; screw
 - 2. Lid inscription: Water.

2.6 CONCRETE ENCASEMENT AND CRADLES

- A. Concrete:
 - 1. As specified in Section 03 3000 - Cast-in-Place Concrete.
 - 2. Type: Reinforced, air entrained.
 - 3. Compressive Strength: 4,000 psi at 28 days.
 - 4. Finish: Rough troweled.
- B. Concrete Reinforcement: As specified in Section 03 3000 – Cast-in-place Concrete.

2.7 MATERIALS

- A. Bedding and Cover:
 - 1. Bedding: Fill Type as specified in Section 31 2000 - Earth Moving.
 - 2. Cover: Fill Type as specified in Section 31 2000 - Earth Moving.
 - 3. Soil Backfill from above Pipe to Finish Grade:
 - a. Soil Type as specified in Section 31 2000 - Earth Moving.
 - b. Subsoil with no rocks greater than 6 inches in diameter, frozen earth, or foreign matter.

2.8 FINISHES

- A. Steel: Hot-dip galvanized after fabrication, according to ASTM A123/A123M.
- B. Protective Coating: Bituminous paint.

2.9 ACCESSORIES

- A. Thrust Restraints: As specified in 2020 Construction Specifications City of Bloomington Utilities standards.
- B. Air-Release Valves:
 - 1. As located on Drawings.
 - 2. As specified in 2020 Construction Specifications City of Bloomington Utilities standards.
- C. Pipe Markers: As specified in 2020 Construction Specifications City of Bloomington Utilities standards.
- D. Vaults: As specified in 2020 Construction Specifications City of Bloomington Utilities.
- E. Steel Rods, Bolt, Lugs, and Brackets:
 - 1. Comply with ASTM A36/A36M.
 - 2. Grade A carbon steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 7000 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that existing utility water main size, location, and invert are as indicated on Drawings.

3.2 PREPARATION

- A. Section 01 7000 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Preconstruction Site Photos:
 - 1. As specified in Section 01 7000 - Execution and Closeout Requirements.
 - 2. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 100 feet of pipe trench.
 - 3. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.
 - 4. Include Project description, date taken, and sequential number on back of each photograph.

- C. Pipe Cutting:
 - 1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
 - 2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
 - 3. Grind edges smooth with beveled end for push-on connections.
- D. Remove scale and dirt on inside and outside before assembly.
- E. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Bedding:
 - 1. Excavation:
 - a. As specified in Section 31 2000 – Earth Moving <_____ - _____>.
 - b. Hand trim for accurate placement of pipe to elevations as indicated on Drawings.
 - 2. Dewater excavations to maintain dry conditions and to preserve final grades at bottom of excavation.
 - 3. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches of compacted depth, and compact to 95 percent of maximum density.
- B. Piping:
 - 1. Comply with AWWA C600.
 - 2. Handle and assemble pipe according to manufacturer instructions and as indicated on Drawings.
 - 3. Steel Rods, Bolts, Lugs, and Brackets: Coat buried steel before backfilling.
 - 4. Maintain 10 feet of horizontal separation between water main and sewer piping according to City of Bloomington code.
 - 5. Ductile-Iron Piping and Fittings: Comply with AWWA C600.
 - 6. Field Welding Materials: Comply with AWWA C206.
 - 7. Flanged Joints: Do not use in underground installations except within structures.
 - 8. Route pipe in straight line, and re-lay pipe that is out of alignment or grade.
 - 9. High Points:
 - a. Install pipe with no high points.
 - b. If unforeseen field conditions arise that necessitate high points, install air-release valves as directed by Engineer <_____>.
 - 10. Bearing:
 - a. Maintain bearing along entire length of pipe.
 - b. Do not lay pipe in wet or frozen trench.
 - 11. Prevent foreign material from entering pipe during placement.
 - 12. Allow for expansion and contraction without stressing pipe or joints.
 - 13. Close pipe openings with watertight plugs during Work stoppages.
 - 14. Install access fittings to permit disinfection of water system performed under 2020 Construction Specifications City of Bloomington Utilities standards..
 - 15. Cover:
 - a. Establish elevations of buried piping with not less than four feet of cover.
 - b. Measure depth of cover from final surface grade to top of pipe barrel.
 - 16. Pipe Markers: As specified in 2020 Construction Specifications City of Bloomington Utilities standards.

- C. Valves and Hydrants: As specified in 2020 Construction Specifications City of Bloomington Utilities standards.
- D. Tapping Sleeves and Valves: As indicated on Shop Drawings and according to manufacturer instructions.
- E. PE Encasement:
 - 1. Encase piping in PE as indicated on Drawings to prevent contact with surrounding backfill material.
 - 2. Comply with AWWA C105.
 - 3. Terminate encasement 3 to 6 inches above ground where pipe is exposed.
- F. Thrust Restraints: As specified in 2020 Construction Specifications City of Bloomington Utilities standards.
- G. Service Connections: As specified in Section 33 1417 - Site Water Service Utility Laterals.
- H. Backfilling:
 - 1. Backfill around sides and to top of pipe with cover fill in minimum lifts of 6 inches, tamp in place, and compact to 95 percent of maximum density.
 - 2. Place and compact material immediately adjacent to pipes to avoid damage to pipe and prevent pipe misalignment.]
 - 3. Maintain optimum moisture content of bedding material to attain required compaction density.
- I. Disinfection of Potable Water Piping Systems:
- J. Installation Standards: Install Work according to 2020 Construction Specifications of City of Bloomington Utilities standards.

3.4 TOLERANCES

- A. Refer to Section 01 4000 - Quality Requirements: Requirements for additional tolerance requirements.
- B. Install pipe to indicated elevation within tolerance of 5/8 inch.

3.5 FIELD QUALITY CONTROL

- A. Field quality assurance and quality control test and inspections will be provided by Owner. Refer to Section 01 4000 - Quality Requirements for additional requirements for inspecting and testing.
- B. Testing:
 - 1. Owner will engage testing and inspection agency to perform the following tests and inspections:
 - a. Pressure test piping system according to AWWA C600.
 - b. Perform pressure test on piping according to 2020 Construction Specifications City of Bloomington Utilities standards.
 - c. Compaction Testing:
 - a) Comply with ASTM D1557 and as required by 2020 Construction Specifications City of Bloomington Utilities standards.
 - 2. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Water Main, 12-Inch shall be measured at the contract unit price per Linear Foot. Includes excavation and backfill; pipe, fittings, and appurtenances; bedding; thrust restraints and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.2 Tapping Saddle, 24-inch by 12-inch shall be measured at the contract unit price per Each. Includes excavation and backfill; pipe, fittings, and appurtenances; bedding; and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.3 Tapping Saddle, 12-inch by 12-inch shall be measured at the contract unit price per Each. Includes excavation and backfill; pipe, fittings, and appurtenances; bedding; and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.4 Tapping Valve, 12-inch shall be measured at the contract unit price per Each. Includes excavation, bedding, backfill; valve, fittings, and accessories; and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.5 Mechanical Joint, 12-inch by 12-inch Cross shall be measured at the contract unit price per Each. Includes excavation and backfill; fittings, bedding; thrust restraints other accessories and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.6 Mechanical Joint, 22.5 degree elbow 12-inch shall be measured at the contract unit price per Each. Includes excavation and backfill, fittings, bedding, thrust restraint other accessories and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.7 Mechanical Joint, 45 degree elbow 12-inch shall be measured at the contract unit price per Each. Includes excavation and backfill, fittings, bedding, thrust restraint other accessories and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.8 Mechanical Joint, 90 degree elbow 12-inch shall be measured at the contract unit price per Each. Includes excavation and backfill, fittings, bedding, thrust restraint other accessories and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.9 Mechanical Joint, 12-inch by 12-inch Tee shall be measured at the contract unit price per Each. Includes excavation and backfill, fittings, bedding, thrust restraint other accessories, and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.10 Mechanical Joint Gate Valve, 12-inch shall be measured at the contract unit price per Each. Includes excavation, bedding, backfill; valve, fittings, and accessories; and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.11 Mechanical Joint Plug 12-inch shall be measured at the contract unit price per Each. Includes excavation, bedding, backfill, fittings, thrust restraints and accessories; and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.

- 4.12 24-inch by 6-inch Hot Tap for Fire Hydrant shall be paid measured at the contract unit price per Each. Includes excavation, gravel sump, bedding, backfill, hydrant, valve, connection, and accessories and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.13 Fire Hydrant Assembly shall be paid measured at the contract unit price per Each. Includes excavation, gravel sump, bedding, backfill, hydrant, valve, connection, and accessories and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.14 Temporary Chlorination Tap shall be measured at the contract unit price per Each. Includes excavation and backfill; pipe, fittings, and appurtenances; bedding; thrust restraints and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.15 Temporary Blow-off Assembly shall be measured at the contract unit price per Each. Includes excavation and backfill; pipe, fittings, and appurtenances; bedding; thrust restraints and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.
- 4.16 Testing of Water Mains shall be measured at the contract unit price per Lump Sum. Includes retesting and all other requirements of City of Bloomington Utilities and in accordance with requirements of this section.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Water Main, 12-Inch shall be paid for at the contract unit price per Linear Foot.
- 5.2 The cost of Tapping Saddle, 24-inch by 12-inch shall be paid for at the contract unit price per Each.
- 5.3 The cost of Tapping Saddle, 12-inch by 12-inch shall be paid for at the contract unit price per Each.
- 5.4 The cost of Tapping Valve, 12-inch shall be paid for at the contract unit price per Each.
- 5.5 The cost of Mechanical Joint, 12-inch by 12-inch Cross shall be paid for at the contract unit price per Each.
- 5.6 The cost of Mechanical Joint, 22.5 degree elbow 12-inch shall be paid for at the contract unit price per Each.
- 5.7 The cost of Mechanical Joint, 45 degree elbow 12-inch shall be paid for at the contract unit price per Each.
- 5.8 The cost of Mechanical Joint, 90 degree elbow 12-inch shall be paid for at the contract unit price per Each.
- 5.9 The cost of Mechanical Joint, 12-inch by 12-inch Tee shall be paid for at the contract unit price per Each.
- 5.10 The cost of Mechanical Joint Gate Valve, 12-inch shall be paid for at the contract unit price per Each.
- 5.11 The cost of Mechanical Joint Plug 12-inch shall be paid for at the contract unit price per Each.
- 5.12 The cost of 24-inch by 6-inch Hot Tap for Fire Hydrant shall be paid for at the contract unit price per Each.

- 5.13 The cost of Fire Hydrant Assembly shall be paid for at the contract unit price per Each.
- 5.14 The cost of Temporary Chlorination Tap shall be paid for at the contract unit price per Each.
- 5.15 Temporary Blow-off Assembly shall be paid for at the contract unit price per Each.
- 5.16 The cost of Testing of Water Mains shall be paid for at the contract unit price per Lump Sum.

END OF SECTION 33 1413

SECTION 33 1415 - SITE WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Water-distribution piping and related components outside the building for domestic water service.
- B. Related Requirements:
 - 1. 2020 Construction Specifications City of Bloomington Utilities.
 - 2. Section 03 3000 "Cast-in-Place Concrete."
 - 3. Section 31 2000 "Earth Moving."
 - 4. Section 33 1413 "Public Water Utility Distribution Piping."

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment.

1.3 DEFINITIONS

- A. CDA: Copper Development Association.
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.
- C. PA: Polyamide (nylon) plastic.
- D. PE: Polyethylene plastic.
- E. PP: Polypropylene plastic.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- B. Field Quality-Control Submittals:
 - 1. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of product indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare piping, valves, meters, backflow prevention devices, and fire hydrants according to the following:

1. Ensure that piping, valves, meters, backflow prevention devices, and fire hydrants are dry and internally protected against rust and corrosion.
 2. Protect threaded ends and flange faces against damage.
 3. Set piping, valves, meters, backflow prevention devices, and fire hydrants in best position for handling and to prevent rattling.
- B. During Storage: Use precautions for piping, valves, meters, backflow prevention devices, and fire hydrants according to the following:
1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle products if size requires handling by crane or lift. Rig products to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service in accordance with requirements indicated:
1. Notify Engineer no fewer than two days in advance of proposed interruption of service.
 2. Do not proceed with interruption of water-distribution service without Engineer's written permission.

1.9 COORDINATION

- A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
- B. Comply with standards of authorities having jurisdiction for domestic water-service piping, including materials, installation, testing, and disinfection.
- C. Piping materials to bear label, stamp, or other markings of specified testing agency.

- D. Comply with ASTM F645 for selection, design, and installation of thermoplastic water piping.
- E. All piping and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61/NSF 372 or are certified in compliance with NSF 61/NSF 372 by an ANSI-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PIPING MATERIALS

- A. Comply with requirements in "Piping Applications" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and service sizes.
- B. Potable-water piping and components comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

2.3 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tube: ASTM B88, Type K.
- B. Annealed-Temper Copper Tube: ASTM B88, Type K.
- C. Copper Tube, Pressure-Seal-Joint Fittings:
 - 1. Source Limitations: Obtain copper tube, pressure-seal-joint fittings from single manufacturer.
 - 2. Fittings: Cast brass, cast bronze, or wrought copper with EPDM O-ring seal in each end. NPS 2-1/2 and larger with stainless steel grip ring and EPDM O-ring seal.
 - 3. Minimum 200 psig working-pressure rating at 250 deg F.

2.4 PE PIPE AND FITTINGS

- A. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than 200 psig.
 - 1. PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than 200 psig.

2.5 PIPING JOINING MATERIALS

- A. Gaskets for Ferrous Piping and Copper-Alloy Tubing: ASME B16.21, asbestos free.
- B. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.6 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Flexible Connectors:
 - 1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.

2. Ferrous-Metal Piping: Stainless steel hose covered with stainless steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.
- C. Dielectric Fittings: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
 1. Dielectric Unions:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 250 psig.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.
 2. Dielectric-Flange Insulating Kits: Nonconducting materials for field assembly of companion flanges.
 - a. Pressure Rating: 150 psig.
 - b. Gasket: Neoprene or phenolic.
 - c. Bolt Sleeves: Phenolic or PE.
 - d. Washers: Phenolic with steel backing washers.
 3. Dielectric Nipples:
 - a. Standard: IAPMO PS 66.
 - b. Electroplated steel nipple complying with ASTM F1545.
 - c. Pressure Rating: 300 psig at 225 deg F.
 - d. End Connections: Male threaded or grooved.
 - e. Lining: Inert and noncorrosive, PP.

2.7 CURB VALVES AND METER VALVES

- A. Curb Valves and Meter Valves:
 1. Source Limitations: Obtain curb valves and meter valves from single manufacturer.
- B. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.
 1. Service Boxes for Curb Valves: ASTM A48/A48M, Class 25 cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.
 - a. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.
- C. Meter Valves: Comply with AWWA C800 for high-pressure, service-line valves. Include angle or straight-through-pattern bronze body, ground-key plug or ball, wide tee head, with inlet and outlet matching service piping material.

2.8 WATER METERS

- A. Water Meter - Utility Company Furnished:
 1. Utility Company: City of Bloomington Utilities.

2.9 WATER METER BOXES

- A. Water Meter Boxes:
 1. Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping.

2. Cast-iron body and double cover for disc-type water meter, with lettering "WATER METER" in top cover; and with separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.
3. Water Meter Boxes: Polymer-concrete body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping. Include vertical and lateral design loadings of 15,000 lb minimum over 10 by 10 inches square.

2.10 PRESSURE-REDUCING VALVES

- A. Pressure-Reducing Valves - Direct Acting:
 1. Source Limitations: Obtain pressure-reducing valves - direct acting, from single manufacturer.
 2. Standard: ASSE 1003.
 3. Pressure Rating: Initial pressure of 150 psig.
 4. Size: 1-inch NPS.
 5. Body: Bronze.
 6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.11 RELIEF VALVES

- A. Air-Release Valves:
 1. Source Limitations: Obtain air-release valves from single manufacturer.
 2. Standard: AWWA C512.
 3. Pressure Rating: 300 psig.
 4. Body Material: Cast iron.
 5. Trim Material: Stainless steel, brass, or bronze.
 6. Water Inlet Size: 1-inch NPS.

2.12 VACUUM BREAKERS

- A. Pressure Vacuum Breaker Assembly:
 1. Source Limitations: Obtain pressure vacuum breaker assembly from single manufacturer.
 2. Standard: ASSE 1020.
 3. Operation: Continuous-pressure applications.
 4. Pressure Loss: 5 psig maximum, through middle one-third of flow range.
 5. Size: 1-inch NPS.
 6. Accessories: Ball valves on inlet and outlet.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with excavating, trenching, and backfilling requirements in Section 31 2000 "Earth Moving."

3.2 PIPING APPLICATIONS

- A. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used unless otherwise indicated.
- B. Do not use flanges or unions for underground piping.

- C. Underground water-service piping NPS 3/4 to NPS 3 to be any of the following:
 - 1. Soft copper tube, ASTM B88, Type K; copper, pressure-seal fittings; and pressure-sealed joints.
 - 2. PE, ASTM pipe; molded PE fittings; and heat-fusion joints.
- D. Water Meter Box Water-Service Piping: NPS 3/4 to NPS 2 to be same as underground water-service piping.
- E. Aboveground[and vault] water-service piping NPS 3/4 to NPS 3 to be any of the following:
 - 1. Hard copper tube, ASTM B88, Type K; copper, pressure-seal fittings; and pressure-sealed joints.
 - 2. PVC, Schedule 80 pipe; PVC, Schedule 80 socket fittings; and solvent-cemented joints.

3.3 VALVE APPLICATIONS

- A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FM Global, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.
- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Use the following for valves in vaults and aboveground:
 - a. Gate Valves, NPS 2 and Smaller: Bronze, nonrising stem.
 - b. Check Valves: AWWA C508, swing type.
 - 2. Pressure-Reducing Valves: Use for water-service piping in vaults and aboveground to control water pressure.
 - 3. Relief Valves: Use for water-service piping in vaults and aboveground.
 - a. Air-Release Valves: To release accumulated air.
 - b. Air/Vacuum Valves: To release or admit large volume of air during filling of piping.
 - c. Combination Air Valves: To release or admit air.
 - 4. Detector Check Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Comply with 2020 Construction Specifications City of Bloomington Utilities standards for piping-system common requirements.
- B. Provide a continuous bare copper or aluminum tracer wire not less than 0.10 inch in diameter in sufficient length over each separate run of nonmetallic pipe.

3.5 INSTALLATION OF PIPING

- A. Water-Main Connection:
 - 1. Arrange with utility company for tap of size and in location indicated in water main.
 - 2. Tap water main in accordance with requirements of water utility company and of size and in location indicated.
- B. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve in accordance with MSS SP-60.
 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- C. Install PE pipe in accordance with ASTM D2774 and ASTM F645.
- D. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
1. Under Driveways: With at least 36 inches of cover over top.
 2. In Loose Gravelly Soil and Rock: With at least 12 inches of additional cover.
- E. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- F. Extend water-service piping and connect to water-supply source and fountain and irrigation systems at meters in locations and pipe sizes indicated.
1. Terminate water-service piping at meter until fountain and irrigation water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to fountain and irrigation water-piping systems when those systems are installed.
- G. Sleeves are specified in 2020 Construction Specifications City of Bloomington Utilities standards.
- H. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.6 JOINT CONSTRUCTION

- A. Comply with 2020 Construction Specifications City of Bloomington Utilities standards for basic piping joint construction.
- B. Make pipe joints according to the following:
1. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools and procedures recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.
 2. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners in accordance with fitting manufacturer's written instructions.
 3. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - a. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

3.7 INSTALLATION OF VALVES

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.
- C. UL-Listed or FM Global-Approved Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

- D. UL-Listed or FM Global-Approved Valves Other Than Gate Valves: Comply with NFPA 24.
- E. MSS Valves: Install as component of connected piping system.
- F. Curb Valves: Install each underground curb valve with head pointed up and with service box.
- G. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves. Install full-size valved bypass.
- H. Relief Valves: Comply with AWWA C512. Install aboveground with shutoff valve on inlet.

3.8 INSTALLATION OF DETECTOR-CHECK VALVES

- A. Install in vault or aboveground.
- B. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.
- C. Support detector check valves, meters, shutoff valves, and piping on brick or concrete piers. Comply with requirements of concrete piers in Section 03 3000 "Cast-in-Place Concrete."

3.9 INSTALLATION OF WATER METERS

- A. Install water meters, piping, and specialties in accordance with utility company's written instructions.
- B. Water Meters:
 - 1. Install-type water meters, NPS 2 and smaller, in meter boxes with shutoff valves on water meter inlets. Include valves on water meter outlets and valved bypass around meters unless prohibited by authorities having jurisdiction.
 - 2. Install detector-type water meters in meter vault in accordance with AWWA M6. Include shutoff valves on water meter inlets and outlets and full-size valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

3.10 INSTALLATION OF VACUUM BREAKER ASSEMBLIES

- A. Install pressure vacuum breaker assemblies of type, size, and capacity indicated. Include valves and test cocks. Install in accordance with requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install pressure vacuum breaker assemblies in vault or other space subject to flooding.

3.11 INSTALLATION OF WATER METER BOXES

- A. Install water meter boxes in paved areas flush with surface.
- B. Install water meter boxes in grass or earth areas with top 2 inches above surface.

3.12 INSTALLATION OF CONCRETE VAULTS

- A. Install precast concrete vaults in accordance with ASTM C891.

3.13 CONNECTIONS

- A. See 2020 Construction Specifications City of Bloomington Utilities standards for piping connections to valves and equipment.
- B. Connect water-distribution piping to utility water main. Use tapping sleeve and tapping valve.
- C. Connect water-distribution piping to fountain and irrigation piping.

3.14 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
 - 1. Increase pressure in 50 psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

3.15 IDENTIFICATION

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 31 2000 "Earth Moving."

3.16 CLEANING

- A. Clean and disinfect water-distribution piping as follows:
 - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
 - 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
 - b. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - c. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging and disinfecting activities.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Requirements of this section will be measured at the contract unit price for 1-inch Domestic Water Service, inclusive of water main taps, domestic water piping, water meters and all other elements indicated on Drawings and as required by the City of Bloomington Utilities for each individual water service and in accordance with requirements of this Section.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of 1-inch Domestic Water Service shall be paid for at the unit price Each.

END OF SECTION 33 1415

SECTION 33 3111 - PUBLIC SANITARY SEWERAGE GRAVITY PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sanitary sewerage piping.
 - 2. Connection to existing manholes.
 - 3. Wye branches and tees.
 - 4. Bedding and cover materials.
- B. Related Requirements:
 - 1. 2020 Construction Specifications City of Bloomington Utilities.
 - 2. Section 31 2000 - "Earth Moving": Backfill, and excavation requirements required by this section.
 - 3. 2020 Construction Specifications City of Bloomington Utilities - Mandrel Testing: Deflection testing of plastic sewerage piping.
 - 4. 2020 Construction Specifications City of Bloomington Utilities - Identification and Signage for Utilities: Pipe markers.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment.

1.3 REFERENCE STANDARDS

- A. City of Bloomington Utilities Department (CBU):
 - 1. Construction Specifications (update issue January 1, 2020).
- B. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- C. American Water Works Association:
 - 1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
 - 2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - 3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
 - 4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 5. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
 - 6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.
 - 7. AWWA C153 - Ductile-Iron Compact Fittings.
- D. ASTM International:
 - 1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
 - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe.
 - 4. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe (Metric).
 - 5. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

6. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric).
7. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
8. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
9. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
10. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
11. ASTM C923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals (Metric).
12. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
13. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
14. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
15. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
16. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
17. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
18. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
19. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
20. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
21. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
22. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
23. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
24. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.4 DEFINITIONS

- A. Bedding: Fill placed under, beside, and directly over pipe, prior to subsequent backfill operations.

1.5 COORDINATION

- A. Section 01 3000 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with City of Bloomington Utilities Department.
- C. Notify affected utility companies at least 72 hours prior to construction.

1.6 PREINSTALLATION MEETINGS

- A. Section 01 3000 - Administrative Requirements: Requirements for preinstallation meeting.
- B. Section 4.2.2 of the CBU Construction Specifications.
- C. Convene minimum one week prior to commencing Work of this Section.
- D. Attendance Roster: Include affected utility companies and appropriate City officials.

1.7 SUBMITTALS

- A. Section 01 3300 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer catalog cuts and other information indicating proposed materials, accessories, details, and construction information.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer Instructions: Indicate special procedures required to install specified products.
 - 1. Indicate special procedures required to install specified products.

1.8 CLOSEOUT SUBMITTALS

- A. Section 01 7000 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record invert elevations and actual locations of pipe runs, connections, manholes, and cleanouts.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.9 QUALITY ASSURANCE

- A. Perform Work according to CBU Construction Specifications standards.
- B. Maintain 1 copy of each standard affecting Work of this Section on Site.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 6000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Storage:
 - 1. Store materials according to manufacturer instructions.
 - 2. Store valves in shipping containers with labeling in place.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Block individual and stockpiled pipe lengths to prevent moving.
 - 3. Provide additional protection according to manufacturer instructions.

1.11 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SANITARY SEWERAGE PIPING

- A. Plastic Pipe:
 - 1. In accordance with Section 4.4.2.1 of CBU Construction Specifications.

2.2 MANHOLES

- A. In accordance with Section 4.4.2.2 of 2020 Construction Specifications of City of Bloomington Utilities.

2.3 CONFIGURATION

- A. Shaft Construction: Concentric with eccentric cone top section; lipped male/female joints; sleeved to receive pipe sections.
- B. Shape: Cylindrical.
- C. Clear Inside Dimensions: As indicated on Drawings.
- D. Design Depth: As indicated on Drawings.
- E. Clear Cover Opening: As indicated on Drawings.
- F. Pipe Entry: Furnish openings as indicated on Drawings.
- G. Steps: As indicated on Drawings

2.4 MATERIALS

- A. Bedding and Cover: In accordance with Section 4.4.2 of CBU Construction Specifications.

2.5 SOURCE QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Provide shop inspection and testing of pipe.
- C. Certificate of Compliance:
 - 1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
 - 2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 7000 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that trench cut and excavation base is ready to receive Work of this Section.
- C. Verify that excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

- A. Section 01 7000 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Correct over-excavation with coarse aggregate.
- C. Remove large stones or other hard materials that could damage pipe or impede consistent backfilling or compaction.
- D. Protect and support existing sewer lines, utilities, and appurtenances.
- E. Utilities:
 - 1. Maintain profiles of utilities.
 - 2. Coordinate with other utilities to eliminate interference.
 - 3. Notify Owner's Representative if crossing conflicts occur.

3.3 INSTALLATION

- A. Bedding:
 - 1. Excavate pipe trench as specified in Section _Section 31 2000, "Earth Moving.
 - 2. Excavate to lines and grades as indicated on Drawings, or as required to accommodate installation of encasement.
 - 3. Dewater excavations to maintain dry conditions and to preserve final grades at bottom of excavation.
- B. Piping:
 - 1. Install pipe, fittings, and accessories according to ASTM D2321, and seal joints watertight.
 - 2. Lay pipe to slope gradients as indicated on Drawings.
 - 3. Begin at downstream end of system and progress upstream.
 - 4. Bedding: As indicated on Drawings.
 - 5. Lay bell-and-spigot pipe with bells upstream.
 - 6. Backfill and compact as specified in Section 31 2000 – "Earth Moving".
 - 7. Do not displace or damage pipe when compacting.
 - 8. Connect pipe to existing sewer system at existing manhole, using doghouse manhole connection.
- C. Installation Standards: Install items of this Section according to CBU Construction Specifications Section 4.5.2.

3.4 TOLERANCES

- A. Section 01 4000 - Quality Requirements: Requirements for tolerances.
- B. Maximum Variation from Indicated Slope: 1/8 inch in 10 feet (400 mm).

3.5 FIELD QUALITY CONTROL

- A. Section 01 4000 - Quality Requirements: Requirements for inspecting and testing.
- B. Request inspection by Owner's Representative prior to and immediately after placing bedding.
- C. Testing:
 - 1. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.
 - 2. Owner's Representative will perform testing on Site sanitary sewage system according to CBU Construction Specifications Section 4.5.8.

3.6 PROTECTION

- A. Section 01 7000 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
- C. Cap open ends of piping during periods of Work stoppage.

3.7 ATTACHMENTS

- A. Sanitary Sewer Main:
 - 1. Structure 404: Intersection of West 1st Street and South Morton Street.
 - 2. Structure 406: East of intersection of West 1st Street and proposed Madison Street.
- B. Cleanouts: Extend service laterals with cleanouts to property lines. Locate cleanouts with 2-by-4 stake extending 6 inches above ground. Paint top 4 inches with orange survey paint.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Sanitary Manhole (CBU Std. Det. 1): Includes excavation, backfill, channels and pipe fittings, to indicated depth and connection to existing sewer.
- 4.2 Sanitary Manhole Modified (CBU Std. Det. 1): Includes excavation, backfill, channels, and pipe fittings, to indicated depth and connection to existing sewer.
- 4.3 Conflict Manhole: Includes excavation, backfill, channels and pipe fittings, to indicated depth and connection to existing sewer.
- 4.4 Pipe, Sanitary Sewer, 8-inch, C-900: Includes hand trimming, excavation, bedding, pipe and fittings, to indicated depth and connection to existing sewer.
- 4.5 Pipe, Sanitary Sewer, 8-inch, SDR-35: Includes hand trimming, excavation, bedding, pipe and fittings, to indicated depth and connection to existing sewer.
- 4.6 Pipe, Sanitary Sewer, 8-inch, Ductile Iron: Includes hand trimming, excavation, bedding, pipe and fittings, to indicated depth and connection to existing sewer.
- 4.7 Sanitary Lateral Assembly 6-inch: Includes excavation, backfill and pipe fittings, to indicated depth.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Sanitary Manhole (CBU Std. Det. 1) shall be paid for at the contract unit price per Each.
- 5.2 The cost of Sanitary Manhole Modified (CBU Std. Det. 1) shall be paid for at the contract unit price per Each.
- 5.3 The cost of Conflict Manhole shall be paid for at the contract unit price per Each.
- 5.4 The cost of Pipe, Sanitary Sewer, 8-inch, C-900 shall be paid for at the contract unit price per Linear Foot.
- 5.5 The cost of Pipe, Sanitary Sewer, 8-inch, SDR-35 shall be paid for at the contract unit price per Linear Foot.
- 5.6 The cost of Pipe, Sanitary Sewer, 8-inch, Ductile Iron shall be paid for at the contract unit price per Linear Foot.
- 5.7 The cost of Sanitary Lateral Assembly 6-inch shall be paid for at the contract unit price per Each.

END OF SECTION 33 3111

SECTION 33 4200 - STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete pipe and fittings.
 - 2. Non-pressure transition couplings.
 - 3. Drains.
 - 4. Manholes.
 - 5. Catch basins.
 - 6. Stormwater inlets.
 - 7. Stormwater detention structures.
 - 8. Pipe outlets.
 - 9. Stormwater disposal systems.
- B. Related Requirements:
 - 1. 2020 Construction Specifications for City of Bloomington Utilities.

1.3 UNIT PRICES

- 1.4 Work of this Section is affected by unit prices as indicated in Part 4 "Method of Measurement and Part 5 "Basis of Payment.

1.5 DEFINITIONS

- A. HDPE: High-density polyethylene plastic.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Manholes: Include plans, elevations, sections, details, frames, and covers.
 - 2. Catch basins and stormwater inlets . Include plans, elevations, sections, details, frames, covers, and grates.
 - 3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.
 - 4. Stormwater Disposal Systems: Include plans, elevations, sections, details, frames, covers, and design calculations.

1.7 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

1.8 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect pipe, pipe fittings, and seals from dirt and damage.
- B. Handle manholes in accordance with manufacturer's written rigging instructions.
- C. Handle catch basins and stormwater inlets in accordance with manufacturer's written rigging instructions.

1.10 FIELD CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service in accordance with requirements indicated:
 - 1. Notify Engineer no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without Engineer's written permission.

PART 2 - PRODUCTS

2.1 CONCRETE PIPE AND FITTINGS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide County Materials Corporation reinforced concrete pipe or comparable product by one of the following:
 - 1. FOLTZ Concrete Pipe Co.
 - 2. Northern Concrete Pipe, Inc.
 - 3. Rinker Materials Corporation, Concrete Pipe Division.
- B. Source Limitations: Obtain concrete pipe and fittings from single manufacturer.
- C. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C76.
 - 1. Bell-and-spigot ends and gasketed joints with ASTM C443, rubber gaskets
 - 2. Class IV, Wall A.

2.2 NONPRESSURE TRANSITION COUPLINGS

- A. Comply with ASTM C1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Concrete Pipes: ASTM C443, rubber.
 - 2. For Dissimilar Pipes: ASTM D5926, PVC or other material compatible with pipe materials being joined.
- C. Shielded, Flexible Couplings:
 - 1. Source Limitations: Obtain shielded, flexible couplings from single manufacturer.

2. Description: ASTM C1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

2.3 DRAINS

A. Cast-Iron Area Drains:

1. Manufacturers: Subject to compliance with requirements; provide products by the following:
 - a. East Jordan Iron Works.
2. Source Limitations: Obtain cast-iron area drains from single manufacturer.
3. Description: ASME A112.6.3 gray-iron round body with anchor flange and round secured grate. Include bottom outlet with inside caulk or spigot connection, of sizes indicated.
4. Top-Loading Classification(s): Heavy Duty.

B. Grate Openings: 3/8-by-3-inch slots.

2.4 MANHOLES

A. Designed Precast Concrete Manholes:

1. Description: ASTM C913; designed in accordance with ASTM C890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
3. Joint Sealant: ASTM C990, bitumen or butyl rubber.
4. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
5. Steps: Individual FRP steps; FRP ladder; or ASTM A615/A615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60inches.
6. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
7. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A48/A48M, Class 35 gray iron unless otherwise indicated.

2.5 CONCRETE

A. General: Cast-in-place concrete in accordance with ACI 318, ACI 350, and the following:

1. Cement: ASTM C150/C150M, Type II.

2. Fine Aggregate: ASTM C33/C33M, sand.
 3. Coarse Aggregate: ASTM C33/C33M, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
 2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.
- C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: [1] [2] percent through manhole.
 2. Benches: Concrete, sloped to drain into channel.
 - a. Slope: 8 percent.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
 2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

2.6 CATCH BASINS

- A. Designed Precast Concrete Catch Basins: ASTM C913, precast, reinforced concrete; designed in accordance with ASTM C890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for joint sealants.
1. Joint Sealants: ASTM C990, bitumen or butyl rubber.
 2. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
 3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
 4. Steps: Individual FRP steps; FRP ladder; or ASTM A615/A615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
 5. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.
- B. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include flat grate with small square or short-slotted drainage openings.
1. Size: 24 by 24 inches minimum unless otherwise indicated.
 2. Grate Free Area: Approximately 50 percent unless otherwise indicated.
- C. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.7 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions in accordance with utility standards.
- B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions in accordance with utility standards. Include heavy-duty frames and grates.
- C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions in accordance with utility standards. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy duty[, in accordance with utility standards].

2.8 STORMWATER DETENTION STRUCTURES

- A. HDPE, Stormwater Detention Structures: Constructed of virgin, impact-modified high-density polypropylene or polyethylene copolymers; meeting requirements of ASTM F2922 or ASTM F2418-16a, Standard Specification for Corrugated Wall Stormwater Collection Chambers; of depth, shape, dimensions, and appurtenances indicated.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Advanced Drainage Systems, Inc., "SC-310 Stormtech Chamber".
 2. End Caps: Manufacturer's standard, HDPE end caps.
 3. Inspection Port: Manufacturer's standard, one port for each row of chambers.
- B. Manhole Frames and Covers: ASTM A536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

2.9 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
- B. Riprap Basins: Broken, irregularly sized and shaped, graded stone in accordance with NSSGA's "Quarried Stone for Erosion and Sediment Control."
 1. Average Size: NSSGA No. R-5, screen opening 5 inches.
- C. Filter Stone: In accordance with NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.
- D. Energy Dissipaters: In accordance with NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

2.10 STORMWATER DISPOSAL SYSTEMS

- A. Chamber Systems:
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Hydro International, Aquaswirl.
 2. Source Limitations: Obtain chamber systems from single manufacturer.

3. Storage and Leaching Chambers: Molded PE with perforated sides and open bottom. Include number of chambers, distribution piping, end plates, and other standard components as required for system total capacity.
4. Filtering Material: ASTM D448, Size No. 24, 3/4- to 2-1/2-inch washed, crushed stone or gravel.
5. Filter Mat: Geotextile woven or spun filter fabric, in one or more layers, for minimum total unit weight of 4 oz./sq. yd..

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 31 2000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, nonpressure drainage piping in accordance with the following:
 1. Install piping pitched down in direction of flow.
 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
 3. Install piping with 36- inch-minimum cover.
 4. Install reinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping in accordance with the following:
 1. Join reinforced-concrete sewer piping in accordance with ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
 2. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
 - 1. Use Medium-Duty, top-loading classification drains in earth or unpaved foot-traffic areas.
 - 2. Use Medium-Duty, top-loading classification drains in paved foot-traffic areas.
 - 3. Use Heavy-Duty, top-loading classification drains in vehicle-traffic service areas.
 - 4. Use Extra-Heavy-Duty, top-loading classification drains in roads.
- B. Embed drains in 4-inch-minimum concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.

3.5 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants in accordance with ASTM C891.
- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.6 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.7 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

3.8 CONCRETE PLACEMENT

- A. Place cast-in-place concrete in accordance with ACI 318.

3.9 STORMWATER DISPOSAL SYSTEM INSTALLATION

- A. Piping Systems: Excavate trenches of width and depth, and install piping system, filter fabric, and backfill, in accordance with piping manufacturer's written instructions.

3.10 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 22 1413 "Facility Storm Drainage Piping."
- B. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 - 4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
 - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 - a. Shielded flexible couplings for same or minor difference OD pipes.
 - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.11 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8- inch-thick, brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
 - 1. Remove manhole or structure and close open ends of remaining piping.
 - 2. Remove top of manhole or structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
- C. Backfill to grade in accordance with Section 31 2000 "Earth Moving."

3.12 IDENTIFICATION

- A. Materials and their installation are specified in Section 31 2000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.13 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Owner's Representative will test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 3. Gravity-Flow Storm Drainage Piping: Owner's Representative will test in accordance with requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.14 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Pipe, Storm Sewer,, 12 In., RCP: Includes excavation, bedding, backfill, pipe and fittings to indicated depth.
- 4.2 Pipe, Storm Sewer, 15 In., RCP: Includes excavation, bedding, backfill, pipe and fittings to indicated depth.
- 4.3 Pipe, Storm Sewer, 18 In., RCP: Includes excavation, bedding, backfill, pipe and fittings to indicated depth.
- 4.4 Pipe, Storm Sewer, 24 In., RCP: Includes excavation, bedding, backfill, pipe and fittings to indicated depth.
- 4.5 Pipe, Storm Sewer, 36 In., RCP: Includes excavation, bedding, backfill, pipe and fittings to indicated depth.
- 4.6 Pipe, Storm Sewer, 6 In., PVC: Includes excavation, bedding, backfill, pipe and fittings to indicated depth.
- 4.7 Pipe, Storm Sewer, 15 In., PVC: Includes excavation, bedding, backfill, pipe and fittings to indicated depth.
- 4.8 Pipe, Storm Sewer, 12 In., HDPE: Includes excavation, bedding, backfill, pipe and fittings to indicated depth.
- 4.9 Pipe, Storm Sewer, 15 In., HDPE: Includes excavation, bedding, backfill, pipe and fittings to indicated depth.
- 4.10 Pipe, Storm Sewer, 18 In., HDPE: Includes excavation, bedding, backfill, pipe and fittings to indicated depth.
- 4.11 Pipe End Section, 18-inch Diameter: Includes excavation, bedding, backfill pipe fittings, and rip rap.
- 4.12 Nyloplast Drain Basin: Includes excavation, bedding, backfill and pipe fittings to indicated depth.
- 4.13 Centerstone Stormwater Detention System: Includes excavation, bedding, backfill and pipe fittings to indicated depth.
- 4.14 Plaza Stormwater Detention System: Includes excavation, bedding, backfill and pipe fittings to indicated depth.
- 4.15 Lot 1 Stormwater Detention System: Includes excavation, bedding, backfill and pipe fittings to indicated depth.
- 4.16 Lot 5 Stormwater Detention System: Includes excavation, bedding, backfill and pipe fittings to indicated depth.
- 4.17 Manhole, Type J: Includes excavation, bedding, backfill and pipe fittings to indicated depth.
- 4.18 Manhole, Type C: Includes excavation, bedding, backfill and pipe fittings to indicated depth.
- 4.19 Manhole, Type K: Includes excavation, bedding, backfill and pipe fittings to indicated depth.

- 4.20 Manhole, Type D: Includes excavation, bedding, backfill and pipe fittings to indicated depth.
- 4.21 Inlet, Type A Includes excavation, bedding, backfill and pipe fittings to indicated depth.:
- 4.22 Inlet, Type J: Includes excavation, bedding, backfill and pipe fittings to indicated depth.
- 4.23 Inlet, Type M: Includes excavation, bedding, backfill and pipe fittings to indicated depth.
- 4.24 24-inch by 24-inch Rectangular Concrete Structure: Includes excavation, bedding, backfill and pipe fittings to indicated depth.
- 4.25 AquaSwirl XC-4: Includes excavation, bedding, backfill and pipe fittings to indicated depth.
- 4.26 AquaSwirl XC-7: Includes excavation, bedding, backfill and pipe fittings to indicated depth.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Pipe, 12-inch, RCP shall be paid for at the contract unit price per Linear Foot.
- 5.2 The cost of Pipe, 15-inch, RCP shall be paid for at the contract unit price per Linear Foot.
- 5.3 The cost of Pipe, 18-inch, RCP shall be paid for at the contract unit price per Linear Foot.
- 5.4 The cost of Pipe, 24-inch, RCP shall be paid for at the contract unit price per Linear Foot.
- 5.5 The cost of Pipe, 36-inch, RCP shall be paid for at the contract unit price per Linear Foot.
- 5.6 The cost of Pipe, 6-inch, PVC shall be paid for at the contract unit price per Linear Foot.
- 5.7 The cost of Pipe, 15-inch, PVC shall be paid for at the contract unit price per Linear Foot.
- 5.8 The cost of Pipe, 12-inch, HDPE shall be paid for at the contract unit price per Linear Foot.
- 5.9 The cost of Pipe, 15-inch, HDPE shall be paid for at the contract unit price per Linear Foot.
- 5.10 The cost of Pipe, 18-inch, HDPE shall be paid for at the contract unit price per Linear Foot.
- 5.11 The cost of Pipe End Section, 18-inch Diameter shall be paid for at the contract unit price per Linear Foot.
- 5.12 The cost of Nyloplast Drain Basin shall be paid for at the contract unit price per Each.
- 5.13 The cost of Centerstone Stormwater Detention shall be paid for at the contract unit price per Lump Sum.
- 5.14 The cost of Plaza Stormwater Detention shall be paid for at the contract unit price per Lump Sum.

- 5.15 The cost of Lot 1 Stormwater Detention shall be paid for at the contract unit price per Lump Sum.
- 5.16 The cost of Lot 5 Stormwater Detention shall be paid for at the contract unit price per Lump Sum.
- 5.17 The cost of Manhole, Type J shall be paid for at the contract unit price per Each.
- 5.18 The cost of Manhole, Type C shall be paid for at the contract unit price per Each.
- 5.19 The cost of Manhole, Type K shall be paid for at the contract unit price per Each.
- 5.20 The cost of Manhole, Type D shall be paid for at the contract unit price per Each.
- 5.21 The cost of Inlet, Type A shall be paid for at the contract unit price per Each.
- 5.22 The cost of Inlet, Type J shall be paid for at the contract unit price per Each.
- 5.23 The cost of Inlet, Type M shall be paid for at the contract unit price per Each.
- 5.24 The cost of 24-inch by 24-inch, Rectangular Concrete Structure shall be paid for at the contract unit price per Each.
- 5.25 The cost of AquaSwirl XC-4 shall be paid for at the contract unit price per Each.
- 5.26 The cost of AquaSwirl XC-7 shall be paid for at the contract unit price per Each.

END OF SECTION 33 4200

SECTION 33 4600 - SUBDRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Perforated-wall pipe and fittings.
 - 2. Geotextile filter fabrics.
- B. Related Requirements:
 - 1. 2022 Indiana Department of Transportation Standard Specifications, Section 718.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 PERFORATED-WALL PIPES AND FITTINGS

- A. Perforated PE Pipe and Fittings:
 - 1. NPS 6 and Smaller: ASTM F405 or AASHTO M 252, Type CP; corrugated, for coupled joints.
 - 2. Couplings: Manufacturer's standard, band type.

2.2 SOIL MATERIALS

- A. Soil materials are specified in Section 31 2000 "Earth Moving."

2.3 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 in accordance with ASTM D4491.
- B. Structure Type: Nonwoven, needle-punched continuous filament.
 - 1. Survivability: AASHTO M 288 Class 2.
 - 2. Styles: Flat and sock.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. If subdrainage is required for landscaping, 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 Section 31 2000 "Earth Moving."

3.3 FOUNDATION DRAINAGE INSTALLATION

- A. Place impervious fill material on subgrade adjacent to bottom of footing after concrete forms have been removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches deep and 12 inches wide.
- B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.
- C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.
- D. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with adhesive or tape.
- E. Install drainage piping as indicated in Part 3 "Piping Installation" Article.
- F. Add drainage course to width of at least 6 inches on side away from curb and to top of pipe to perform tests.
- G. After satisfactory testing, cover drainage piping to width of at least 6 inches on side away from curb and above top of pipe to within 12 inches of finish grade.
- H. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.
- I. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.

- 3.4 Place backfill material over compacted drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Final backfill to finish elevations and slope away from building.

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 in accordance with manufacturer's written instructions and other requirements indicated.
 - 1. Landscaping Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 24 inches unless otherwise indicated.
 - 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 thermoplastic piping in accordance with ASTM D2321.

3.6 PIPE JOINT CONSTRUCTION

- A. Join perforated PE pipe and fittings with couplings in accordance with ASTM D3212 with loose banded, coupled, or push-on joints.
- B. Join perforated PVC sewer pipe and fittings in accordance with ASTM D3212 with loose bell-and-spigot, push-on joints.
- C. 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.

3.7 CLEANOUT INSTALLATION

- A. Comply with requirements for cleanouts specified in Section 33 4100 "Storm Utility Drainage Piping."
- B. Cleanouts for Landscaping Subdrainage:
 - 1. Install cleanouts from piping to grade. Locate cleanouts at beginning of piping run and at changes in direction. 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 deep. Set top of cleanout flush with grade.
 - 3. In nonvehicular-traffic areas, use NPS 4 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 deep. Set top of cleanout 1 inch above grade.
 - 4. Comply with requirements for concrete specified in Section 03 3000 "Cast-in-Place Concrete."

3.8 CONNECTIONS

- A. Comply with requirements for piping specified in Section 33 4100 "Storm Utility Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect low elevations of subdrainage system to solid-wall-piping storm drainage system.

3.9 IDENTIFICATION

- A. Arrange for installation of green warning tapes directly over piping. Comply with requirements for underground warning tapes specified in specified in Section 31 2000 "Earth Moving."
 - 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.

3.10 FIELD QUALITY CONTROL

- A. Tests and Inspections:

1. After installing drainage course to top of piping, Owner's Representative will test drain piping with water to ensure free flow before backfilling.
2. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

B. Drain piping will be considered defective if it does not pass tests and inspections.

C. Owner's Representative will prepare test and inspection reports.

3.11 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.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Underdrain, 4-inch perforated, Includes excavation, bedding, backfill, pipe and fittings to indicated depth and all other work included in this Section.

PART 5 - BASIS OF PAYMENT

- 5.1 The cost of Underdrain, 4 In., Perforated shall be paid for at the contract unit price per Linear Foot.

END OF SECTION 33 4600

Supplementary Conditions

List of Subjects

None

Supplementary Conditions

None

SECTION VIII

SAMPLE AGREEMENT

AGREEMENT

BETWEEN

CITY OF BLOOMINGTON

ENGINEERING DEPARTMENT

AND

CONTRACTOR

FOR

Hopewell Phase I East Infrastructure Project

THIS AGREEMENT, executed by and between the City of Bloomington, Indiana, Engineering Department through the Board of Public Works (hereinafter CITY), and _____, (hereinafter CONTRACTOR);

WITNESSETH THAT:

WHEREAS, CITY desires to retain CONTRACTOR'S services for the construction of new roadway, sidewalk and multiuse path, curbing, landscaping, stormwater infrastructure, and other work as required per the plans and specifications at the Hopewell Phase I East Site, (more particularly described in Attachment A, "Scope of Work"; and

WHEREAS, CONTRACTOR is capable of performing work as per his/her Bid on the Bid Summary sheet; and

WHEREAS, in accordance with Indiana Code 5-16-13 *et seq.*, incorporated herein by reference, Contractor is a Tier 1 or General Contractor for this project; and

WHEREAS, CONTRACTOR was determined to be the lowest responsible and responsive Bidder for said project.

NOW, THEREFORE, in consideration of the mutual promises hereinafter enumerated, the parties agree as follows:

ARTICLE 1. TERM

1.01 This Agreement shall be in effect upon execution of this Agreement by all parties. In accordance with Indiana Code 5-16-13 *et seq.*, incorporated herein by reference, Contractor is a Tier 1 contractor or general contractor for this project.

ARTICLE 2. SERVICES

2.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described in Attachment A, "Scope of Work".

2.02 All work required under this Agreement shall be substantially completed by the CONTRACTOR by October 31st, 2024, unless the parties mutually agree to a later completion date. Substantial Completion shall mean that all work is sufficiently completed in accordance with the plans and specifications, as modified by any approved change orders, so that it can be used for its intended purpose.

2.03 It is hereby understood by both parties that time is of the essence in this Agreement. Failure of CONTRACTOR to complete all work as herein provided will result in monetary damages to CITY. It is hereby agreed that CITY will be damaged for every day the work has not been performed in the manner herein provided and that the measure of those damages shall be determined by reference Section 13.00 of the General Conditions for Each Day of Overrun in Contract Time. CONTRACTOR agrees to pay CITY said damages or, in the alternative, CITY, at its sole discretion, may withhold monies otherwise due CONTRACTOR. It is expressly understood by the parties hereto that these damages relate to the time of performance and do not limit CITY's other remedies under this Agreement, or as provided by applicable law, for other damages.

2.04 CONTRACTOR agrees that no charges or claims for damages shall be made by him or her for any delays or hindrances, from any cause whatsoever during the progress of any portion of the services specified in the Agreement. Such delays or hindrances, if any, may be compensated for by an extension of time for a reasonable period as may be mutually agreed upon between the parties, it being understood, however, that permitting CONTRACTOR to proceed to complete any service, or any part of the services / project, after the date to which the time of completion may have been extended, shall in no way operate as a waiver on the part of CITY of any of its rights herein.

ARTICLE 3. COMPENSATION

3.01 CONTRACTOR shall provide services as specified in Attachment A, "Scope of Work", attached hereto and incorporated into this Agreement.

3.02 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, subject to adjustment under the Contract, at the unit prices stated in Contractor's Bid, attached hereto as Attachment 'E'. CITY may withhold payment, in whole or in part, to the extent necessary to protect itself from a loss on account of any of the following:

Defective work.

Evidence indicating the probable filing of claims by other parties against CONTRACTOR which may adversely affect CITY.

Failure of CONTRACTOR to make payments due to subcontractors, material suppliers or employees.

Damage to CITY or a third party.

3.03 The submission of any request for payment shall be deemed a waiver and release by CONTRACTOR of all liens and claims with respect to the work and period to which such payment request pertains except as specifically reserved and noted on such request.

3.04 CONTRACTOR shall maintain proper account records for the scope of all services of this Agreement and provide an accounting for all charges and expenditures as may be necessary for audit purposes. All such records shall be subject to inspection and examination by CITY's representatives at reasonable business hours.

3.05 For projects utilizing federal funding the CONTRACTOR shall submit time sheets (WH-347) for his or her own and all subcontracted employees, to City Engineer or his or her representative for approval and review, including review for compliance with Davis Bacon Act requirements, if federal funds are used.

3.06 **Engineer** The City Engineer shall act as the CITY's representative and assume all duties and responsibilities and have all the rights and authority assigned to the Engineer in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE 4. RETAINAGE

For contracts in excess of \$100,000 and for which Contractor requested Progressive Payments on its Bid Form, the Owner requires that retainage be held set out below.

4.01 **Escrow Agent** The retainage amount withheld shall be placed in an escrow account. First Financial Bank, Bloomington, Indiana, shall serve as the escrow agent.

4.02 **Retainage Amount** The escrow agent, Owner and Contractor shall enter into a written escrow agreement. Under that agreement, the Owner shall withhold five percent (5%) of the dollar value of all work satisfactorily completed until the Contract work is complete. The escrow agent shall invest all escrowed principal in obligations selected by the escrow agent. The escrow agent shall be compensated for the agent's services by a reasonable fee, agreed upon by the parties, that is comparable with fees charged for the handling of escrow accounts of similar size and duration. The fee shall be paid from the escrow income. The escrow agent's fee may be determined by specifying an amount of interest the escrow agent will pay on the escrowed amount, with any additional earned interest serving as the escrow agent's fee. The escrow agreement may include other terms and conditions as deemed necessary by the parties. However, if Contractor intends to receive a Single Lump Sum payment upon acceptance of this project, retainage will not be required and an Escrow Agreement will not be required.

4.03 **Payment of Escrow Amount** The escrow agent shall hold the escrowed principal and income until receipt of the notice from the Owner and Contractor that the Contract work has been substantially completed to the reasonable satisfaction of the Owner, at which time the Owner shall pay to the Contractor the balance to be paid under this Contract and execute such documents as are necessary to authorize the escrow agent to pay to the Contractor the funds in the escrow account, including both specifying the part of the escrowed principal to be released from the escrow and the person to whom that portion is to be released. After receipt of the notice, the escrow agent shall remit the designated part of the escrowed principal and the escrowed income, minus the escrow agent's fees, to the person specified in the notice. However, nothing in this section shall prohibit Owner from requiring the escrow agent to withhold amounts necessary to complete minor items of the Contract, following substantial completion of the Contract in accordance with the provisions of paragraph 4.04.

4.04 **Withholding Funds for Completion of Contract** If, upon substantial completion of the Contract, there still remains minor Contract work that needs to be completed, or minor Contract work that needs to be performed to the satisfaction of the Owner, Owner may direct the escrow agent to retain in the escrow account, and withhold from payment to the Contractor, an amount equal to two hundred percent (200%) of the value of said work. The value of said work shall be determined by the

architect/engineer. The escrow agent shall release the funds withheld under this section after receipt of notice from the Owner that all work on the Contract has been satisfactorily completed. In the event that said work is not completed by the Contractor, but by Owner or another party under contract with the Owner, said funds shall be released to the Owner.

ARTICLE 5. GENERAL PROVISIONS

5.01 CONTRACTOR agrees to indemnify and hold harmless CITY and its officers, agents, officials and employees for any and all claims, actions, causes of action, judgments and liens arising out of any negligent act or omission by CONTRACTOR or any of its officers, agents, officials, employees, or subcontractors or any defect in materials or workmanship of any supply, materials, mechanism or other product or service which it or any of its officers, agents, officials, employees, or subcontractors has supplied to CITY or has used in connection with this Agreement and regardless of whether or not it is caused in part by a party indemnified herein under. Such indemnity shall include attorney's fees and all costs and other expenses arising there from or incurred in connection therewith and shall not be limited by reason of the enumeration of any insurance coverage required herein.

CONTRACTOR shall indemnify and hold harmless CITY and its officers, agents, officials and employees for any and all damages, actions, costs, (including, but not limited to, attorney's fees, court costs and costs of investigation) judgments and claims by anyone for damage to property, injury or death to persons resulting from the collapse or failure of any trenches, ditches or other excavations constructed under or associated with this contract.

5.02 Abandonment, Default and Termination

5.02.01 CITY shall have the right to abandon the work contracted for in this Agreement without penalty. If CITY abandons the work described herein, CONTRACTOR shall deliver to CITY all surveys, notes, drawings, specifications and estimates completed or partially completed and these shall become the property of CITY. The earned value of the work performed shall be based upon an estimate of the proportion between the work performed by CONTRACTOR under this Agreement and the work which CONTRACTOR was obligated to perform under this Agreement. This proportion shall be mutually agreed upon by CITY and CONTRACTOR. The payment made to CONTRACTOR shall be paid as a final payment in full settlement of his or her services hereunder.

5.02.02 If CONTRACTOR defaults or fails to fulfill in a timely and proper manner the obligations pursuant to this Agreement, CITY may, after seven (7) days' written notice has been delivered to CONTRACTOR, and without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due to CONTRACTOR. In the alternative, CITY, at its option, may terminate this Agreement and take possession of the site and of all materials, equipment, tools and construction equipment and machinery thereon owned by CONTRACTOR, and may finish the project by whatever method it may deem expedient, and if the such action exceeds the unpaid balance of the sum amount, CONTRACTOR or his or her surety, shall pay the difference to CITY.

5.02.03 Default: If CONTRACTOR breaches this Agreement or fails to perform the work in an acceptable manner, he or she shall be considered in default. Any one or more of the following will be considered a default:

Failure to begin the work under this Agreement within the time specified.

Failure to perform the work with sufficient supervision, workmen, equipment and materials to insure prompt completion of said work within the time limits allowed.

Unsuitable performance of the work as determined by CITY ENGINEER or his or her representative.

Neglecting or refusing to remove defective materials or failure to perform anew such work as shall have been rejected.

Discontinuing the prosecution of the work or any part of it.

Inability to finance the work adequately.

If, for any other reason, CONTRACTOR breaches this Agreement or fails to carry on the work in an acceptable manner.

5.02.04 CITY shall send CONTRACTOR a written notice of default. If CONTRACTOR, or his or her Surety, within a period of ten (10) days after such notice, fails to remedy the default, then CITY shall have full power and authority, without violation of the Contract, to take the prosecution of the work out of the hands of said CONTRACTOR, to appropriate or use any or all materials and equipment on the ground as may be suitable and acceptable, and may, at its option, turn the work over to the Surety, or enter into an agreement with another Contractor for the completion of the Agreement according to the terms and provisions thereof, or CITY may use such other methods as, in its opinion, shall be required for the completion of said Contract in an acceptable manner.

5.02.05 All cost of completing the work under the Contract shall be deducted from the monies due or which may become due to said CONTRACTOR. In case the expenses so incurred by CITY shall be less than the sum which would have been payable under

the Contract if it had been completed by said CONTRACTOR, CONTRACTOR shall be entitled to receive the difference. However, in case such expense shall exceed the sum which would have been payable under the Contract, CONTRACTOR and his or her Surety will be liable and shall pay to CITY the amount of said excess. By taking over the prosecution of the work, CITY does not forfeit the right to recover damages from CONTRACTOR or his or her Surety for his or her failure to complete the work in the time specified.

5.02.06 Notwithstanding any other provision of this Agreement, if funds for the continued fulfillment of the Agreement by CITY are at any time not forthcoming or are insufficient, through failure of any entity to appropriate the funds or otherwise, then CITY shall have the right to terminate this Agreement without penalty by giving prior written notice documenting the lack of funding in which instance, unless otherwise agreed to by the parties, this Agreement shall terminate and become null and void.

5.02.07 CITY agrees that it will make its best effort to obtain sufficient funds, including but not limited to, including in its budget for each fiscal period during the term hereof a request for sufficient funds to meet its obligations hereunder in full.

5.03 Successors and Assigns

5.03.01 Both parties agree that for the purpose of this Agreement, CONTRACTOR shall be an Independent Contractor and not an employee of CITY.

5.03.02 No portion of this Agreement shall be sublet, assigned, transferred or otherwise disposed of by CONTRACTOR except with the written consent of CITY being first obtained. Consent to sublet, assign, transfer, or otherwise dispose of any portion of this Agreement shall not be construed to relieve CONTRACTOR of any responsibility of the fulfillment of this Agreement.

5.04 Extent of Agreement: Integration

5.04.01 This Agreement consists of the following parts, each of which is as fully a part of this Agreement as if set out herein:

1. This Agreement and its Attachments.
2. All Written Amendments and other documents amending, modifying, or supplementing the Contract Documents which may be delivered or issued after the Effective Date of the Agreement and are not attached hereto.
3. All Addenda to the Bid Documents.
4. The Invitation to Bidders.
5. The Instructions to Bidders.
6. The Special Conditions.
7. All plans as provided for the work that is to be completed.
8. The Supplementary Conditions.
9. The General Conditions.
10. The Specifications.
11. The current Indiana Department of Transportation Standard Specifications and the latest addenda.
12. CONTRACTOR'S submittals.
13. The Performance Bond and the Payment Bond.
14. The Escrow Agreement.
15. Request for Taxpayer Identification number and certification: Substitute W-9.

5.04.02 In resolving conflicts, errors, discrepancies and disputes concerning the Scope of Work to be performed by CONTRACTOR, and other rights and obligations of CITY and CONTRACTOR, the document expressing the greater quantity, quality or other scope of work in question, or imposing the greater obligation upon CONTRACTOR and affording the greater right or remedy to CITY shall govern; otherwise the documents shall be given precedence in the order as enumerated above.

5.05 Insurance

5.05.01

CONTRACTOR shall, as a prerequisite to this Agreement, purchase and thereafter maintain such insurance as will protect him or her from the claims set forth below which may arise out of or result from CONTRACTOR'S operations under this Agreement, whether such operations be by CONTRACTOR or by any SUBCONTRACTORS or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

<u>Coverage</u>	<u>Limits</u>
A. Worker's Compensation & Disability	Statutory Requirements
B. Employer's Liability Bodily Injury by Accident	\$100,000 each accident

	Bodily Injury by Disease	\$500,000 policy limit
	Bodily Injury by Disease	\$100,000 each employee
C.	Commercial General Liability (Occurrence Basis) Bodily Injury, personal injury, property damage, contractual liability, products-completed operations, General Aggregate Limit (other than Products/Completed Operations)	\$1,000,000 per occurrence and \$2,000,000 in the aggregate
	Products/Completed Operation	\$1,000,000
	Personal & Advertising Injury Limit	\$1,000,000
	Each Occurrence Limit	\$1,000,000
	Fire Damage (any one fire)	\$50,000
D.	Comprehensive Auto Liability (single limit, owned, hired and non-owned)	\$1,000,000 each accident
	Bodily injury and property damage	
E.	Umbrella Excess Liability	\$5,000,000 each occurrence and aggregate
	The Deductible on the Umbrella Liability shall not be more than	\$10,000

5.05.02 CONTRACTOR'S comprehensive general liability insurance shall also provide coverage for the following:

Premises and operations;

Contractual liability insurance as applicable to any hold-harmless agreements;

Completed operations and products; which also must be maintained for a minimum period of two (2) years after final payment and CONTRACTOR shall continue to provide evidence of such coverage to CITY on an annual basis during the aforementioned period;

Broad form property damage - including completed operations;

Fellow employee claims under Personal Injury; and

Independent Contractors.

5.05.03 With the prior written approval of CITY, CONTRACTOR may substitute different types or amounts of coverage for those specified as long as the total amount of required protection is not reduced.

5.05.04 Certificates of Insurance showing such coverage then in force (but not less than the amount shown above) shall be on file with CITY prior to commencement of work. These Certificates shall contain a provision that coverage afforded under the policies will not be canceled or non-renewed until at least sixty (60) days' prior written notice has been received by CITY. The CITY shall be named as an additional insured on the Commercial General Liability, Automobile Liability, and Umbrella Excess Liability policies. The CONTRACTOR shall agree to a waiver of subrogation on its Worker's Compensation policy.

5.06 **Necessary Documentation** CONTRACTOR certifies that it will furnish CITY any and all documentation, certification, authorization, license, permit or registration required by the laws or rules and regulations of the City of Bloomington, the State of Indiana and the United States. CONTRACTOR further certifies that it is now and will maintain in good standing with such governmental agencies and that it will keep its license, permit registration, authorization or certification in force during the term of this Agreement.

5.07 **Applicable Laws** CONTRACTOR agrees to comply with all federal, state, and local laws, rules and regulations applicable to CONTRACTOR in performing work pursuant to this Agreement, including, but not limited to, discrimination in employment, prevailing wage laws, conflicts of interest, public notice, accounting records and requirements. CONTRACTOR shall comply with City of Bloomington Ordinance 2.21.020 and all other federal, state and local laws and regulations governing non-discrimination, including but not limited to employment. This Agreement shall be governed by the laws of the United States, and the State of Indiana, and by all Municipal Ordinances and Codes of the City of Bloomington. Venue of any disputes arising under this Agreement shall be in the Monroe Circuit Court, Monroe County, Indiana.

5.08 Non-Discrimination

5.08.01 CONTRACTOR and subcontractors shall not discriminate against any employee or applicant for employment, to be employed in the performance of this Agreement, with respect to hire, tenure, terms, training, conditions or privileges of employment, because of race, sex, color, religion, national origin, ancestry, disability, sexual orientation, gender identity, veteran status or housing status. Breach of this covenant may be regarded as a material breach of the Agreement.

5.08.02 CONTRACTOR certifies for itself and all its subcontractors compliance with existing laws of the City of Bloomington, the State of Indiana and the United States regarding:

Prohibition of discrimination in employment practices on the basis of race, sex, color, religion, national origin, ancestry, disability, sexual orientation, gender identity, veteran status, housing status, or any other legally protected classification;

The utilization of Minority and Women Business Enterprises. CONTRACTOR further certifies that it:

- a. Has formulated its own Affirmative Action plan for the recruitment, training and employment of minorities and women, including goals and timetable; which has been approved by the City's Contract Compliance Officer.
- b. Encourages the use of small business, minority-owned business and women-owned business in its operations.

CONTRACTOR understands that the City of Bloomington prohibits its employees from engaging in harassment or discrimination of any kind, including harassing or discriminating against independent contractors doing work for the City. If CONTRACTOR believes that a City employee engaged in such conduct towards CONTRACTOR and/or any of its employees, CONTRACTOR or its employees may file a complaint with the City department head in charge of the CONTRACTOR'S work and/or with the City human resources department or the Bloomington Human Rights Commission. The City takes all complaints of harassment and discrimination seriously and will take appropriate disciplinary action if it finds that any City employee engaged in such prohibited conduct.

5.08.03 FURTHER, PURSUANT TO INDIANA CODE 5-16-6-1, CONTRACTOR AGREES:

A) That in the hiring of employees for the performance of work under this Agreement or any sub agreement hereunder, no contractor, or subcontractor, nor any person acting on behalf of such CONTRACTOR or subcontractor, shall by reason of race, sex, color, religion, national origin, ancestry, or any other legally protected classification, discriminate against any citizen of the State of Indiana who is qualified and available to perform the work to which the employment relates.

B) That no contractor, subcontractor, or any person on their behalf, shall, in any manner, discriminate against or intimidate any employee hired for performance of work under this Agreement on account of race, religion, color, sex, national origin, ancestry, or any other legally protected classification.

C) That there may be deducted from the amount payable to CONTRACTOR, by CITY, under this Agreement, penalty of Five Dollars (\$5.00) for each person for each calendar day during which such person was discriminated against or intimidated in violation of the provisions of this Agreement. Any such person discriminated against retains the right to file a discrimination complaint with the appropriate civil rights agency or court.

D) That this Agreement may be canceled or terminated by CITY and all money due or to become hereunder may be forfeited, for a second or any subsequent violations of the terms or conditions under this section of the Agreement.

5.09 Workmanship and Quality of Materials

5.09.01 CONTRACTOR shall guarantee the work for a period of one (1) year from the date of substantial completion. Failure of any portion of the work within one (1) year due to improper construction, materials of construction, or design may result in a refund to CITY of the purchase price of that portion which failed or may result in the forfeiture of CONTRACTOR'S Performance Bond.

5.09.02 OR EQUAL: Wherever in any of the Agreement Documents an article, material or equipment is defined by describing a proprietary product, or by using the name of a manufacturer or vender, the term "Or Equal" or the term "The Equivalent" if not inserted, shall be implied, and it is done for the express purpose of establishing a basis of durability and efficiency and not for the purpose of limiting completion. Whenever material or equipment is submitted for approval as being equal to that specified, the submittal shall include sufficient information and data to demonstrate that the material or equipment conforms to the Contract requirements. The decision as to whether or not such material

or equipment is equal to that specified shall be made by the ENGINEER. The approval by the ENGINEER of alternate material or equipment as being equivalent to that specified, shall not in any way relieve CONTRACTOR of responsibility for failure of the material or equipment due to faulty design, material, or workmanship, to perform the function required by the Contract Documents. Specifications as determined by other entities within the City of Bloomington such as City Utilities shall only be substituted or changed by their approval which shall be submitted in writing to the ENGINEER.

5.09.03 CITY shall be the sole judge of the sufficiency of workmanship and quality of materials. Disputes shall be resolved by the City Engineer and are not subject to arbitration.

5.10 Safety. CONTRACTOR shall be responsible for the safety of employees at all times and shall provide all equipment necessary to insure their safety. CONTRACTOR shall ensure the enforcement of all applicable safety rules, regulations, ordinances and laws, whether federal, state or local. Contractor's Superintendent of Safety shall make daily inspections upon the arrival and leaving of the site at the close of each workday.

5.10.01 CONTRACTOR is required to comply with IOSHA regulations 29 C.F.R 1926, Subpart P, Excavations for all trenches of at least five (5) feet in depth. All cost for trench safety systems shall be the responsibility of the CONTRACTOR and included in the cost of the principal work with which the safety systems are associated. CONTRACTOR shall sign an affidavit, attached as Attachment B, affirming that CONTRACTOR shall maintain compliance with IOSHA requirements for excavations of at least five (5) in depth.

5.11 Amendments/Changes

5.11.01 Except as provided in Paragraph 5.11.02, this Agreement may be amended only by written instrument signed by both CITY and CONTRACTOR.

5.11.02 Without invalidating the Agreement and without notice to any surety, CITY may, at any time or from time to time, order, in writing, additions, deletions, or revisions in the work. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the work involved, which will be performed under the applicable conditions of the Agreement Documents.

5.11.03 If CONTRACTOR believes that any direction of CITY under paragraph 5.11.02, or any other event or condition, will result in an increase in the Contract time or price, he or she shall file written notice with CITY no later than twenty (20) calendar days after the occurrence of the event giving rise to the claim and stating the general nature of the claim with supporting data. No claim for any adjustment of the Contract time or price will be valid if not submitted in accordance with this Paragraph.

5.11.04 CONTRACTOR shall carry on the work and adhere to the progress schedule during all disputes or disagreements with CITY. No work shall be delayed or postponed pending resolution of any dispute or disagreement except as CONTRACTOR and CITY may otherwise agree in writing.

5.12 Performance Bond and Payment Bond

5.12.01 For contracts in excess of \$100,000, CONTRACTOR shall provide CITY with a Performance Bond and a Payment Bond in the amount of one hundred percent (100%) of the contract amount.

5.12.02 Failure by CONTRACTOR to perform the work in a timely or satisfactory fashion may result in forfeiture of CONTRACTOR'S Performance Bond.

5.12.03 If the surety on any bond furnished by CONTRACTOR becomes a party to supervision, liquidation, or rehabilitation action pursuant Indiana Code 27-9 et seq. or its right to do business in the State of Indiana is terminated, CONTRACTOR shall, within thirty (30) calendar days thereafter, substitute another bond and surety, both of which must be acceptable to CITY.

5.13 Payment of Subcontractors CONTRACTOR shall pay all subcontractors, laborers, material suppliers and those performing services to CONTRACTOR on the project under this Agreement. CITY may, as a condition precedent to any payment hereunder, require CONTRACTOR to submit satisfactory evidence of payments of any and all claims of subcontractors, laborers, material suppliers, and those furnishing services to CONTRACTOR. Upon receipt of a lawful claim, CITY shall withhold money due to CONTRACTOR in a sufficient amount to pay the subcontractors, laborers, material suppliers, and those furnishing services to CONTRACTOR.

5.13.01 The surety of the Payment Bond and Performance Bond may not be released until one (1) year after the Board's final settlement with the CONTRACTOR.

5.14 Written Notice Written notice shall be considered as served when delivered in person or sent by mail to the individual, firm, or corporation, or to the last business address of such known to CONTRACTOR who serves the Notice. Notice shall be sent as follows:

TO CITY:

TO CONTRACTOR:

City of Bloomington		
Attn: Matt Smethurst		
P.O. Box 100 Suite 130		
Bloomington, Indiana 47402		

5.15 Severability and Waiver In the event that any clause or provision of this Agreement is held to be invalid by any court of competent jurisdiction, the invalidity of such clause or provision shall not affect any other provision of this Agreement. Failure of either party to insist on strict compliance with any provision of this Agreement shall not constitute waiver of that party’s right to demand later compliance with the same or other provisions of this Agreement.

5.16 Notice to Proceed CONTRACTOR shall not begin the work pursuant to the “Scope of Work” of this Agreement until it receives an official written Notice to Proceed from the City. Contractor shall start active and continuous work on the Agreement within fifteen (15) calendar days after the date of the Notice to Proceed. In no case shall work begin prior to the date of the Notice to Proceed. If a delayed starting date is indicated in the proposal, the fifteen (15) calendar day limitation will be waived. Work day charges will then begin on a date mutually agreed upon, but not later than the delayed starting date specified. In the event that any Agreement is canceled after an award has been made but prior to the issuing of the Notice to Proceed, no reimbursement will be made for any expenses accrued relative to this contract during that period.

5.17 Steel or Foundry Products

5.17.01 To comply with Indiana Code 5-16-8, affecting all contracts for the construction, reconstruction, alteration, repair, improvement or maintenance of public works, the following provision shall be added: If steel or foundry products are to be utilized or supplied in the performance of any contract or subcontract, only domestic steel or foundry products shall be used. Should CITY feel that the cost of domestic steel or foundry products is unreasonable; CITY will notify CONTRACTOR in writing of this fact.

5.17.02 Domestic Steel products are defined as follows:

“Products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two (2) or more of such operations, from steel made in the United States by open hearth, basic oxygen, electric furnace, Bessemer or other steel making process.”

5.17.03 Domestic Foundry products are defined as follows:

“Products cast from ferrous and nonferrous metals by foundries in the United States.”

5.17.04 The United States is defined to include all territory subject to the jurisdiction of the United States.

5.17.05 CITY may not authorize or make any payment to CONTRACTOR unless CITY is satisfied that CONTRACTOR has fully complied with this provision.

5.18 Verification of Employees’ Immigration Status

Contractor is required to enroll in and verify the work eligibility status of all newly-hired employees through the E-Verify program. (This is not required if the E-Verify program no longer exists). Contractor shall sign an affidavit, attached as Attachment C, affirming that Contractor does not knowingly employ an unauthorized alien. “Unauthorized alien” is defined at 8 U.S. Code 1324a(h)(3) as a person who is not a U.S. citizen or U.S. national and is not lawfully admitted for permanent residence or authorized to work in the U.S. under 8 U.S. Code Chapter 12 or by the U.S. Attorney General.

Contractor and any of its subcontractors may not knowingly employ or contract with an unauthorized alien, or retain an employee or contract with a person that the Contractor or any of its subcontractors learns is an unauthorized alien. If the City obtains information that the Contractor or any of its subcontractors employs or retains an employee who is an unauthorized alien, the City shall notify the Contractor or its subcontractors of the Agreement violation and require that the violation be remedied within thirty (30) calendar days of the date of notice. If the Contractor or any of its subcontractors verify the work eligibility status of the employee in question through the E-Verify program, there is a rebuttable presumption that the Contractor or its subcontractor did not knowingly employ an unauthorized alien. If the Contractor or its subcontractor fails to remedy the violation within the thirty (30) calendar day period, the City shall terminate the Agreement, unless the City determines that terminating the Agreement would be detrimental to the public interest or public property, in which case the City may allow the Agreement to remain in effect until the City procures a new contractor. If the City terminates the Agreement, the Contractor or its subcontractor is liable to the City for actual damages.

Contractor shall require any subcontractors performing work under this Agreement to certify to the Contractor that, at the time of certification, the subcontractor does not knowingly employ or contract with an unauthorized alien and the subcontractor has enrolled in and is participating in the E-Verify program. Contractor shall maintain on file all subcontractors' certifications throughout the term of this Agreement with the City.

5.19 Drug Testing Plan

In accordance with Indiana Code 4-13-18 as amended, the CONTRACTOR was required to submit with his/her bid a written drug testing policy for a public works project that is estimated to cost \$150,000 or more. Among other things, the law sets forth specific requirements that must be in the plan for a program to test the employees of the CONTRACTOR and Subcontractors for drugs. The successful CONTRACTOR must comply with all provisions of the statute. This contract is subject to cancellation if CONTRACTOR fails to implement its testing program during the term of this contract, fails to provide information regarding this testing at the request of CITY; or provides false information to CITY regarding CONTRACTOR's employee drug testing program. CONTRACTOR shall sign an affidavit, attached as Attachment D, affirming that CONTRACTOR has and shall implement CONTRACTOR'S employee drug testing program throughout the term of this project.

5.20 Living Wage Ordinance (LWO)

Contractors that are considered "covered employers" under City Ordinance 2.28, otherwise known as the "Living Wage Ordinance," or "LWO," are required to pay their covered employees at least a living wage. Currently, the living wage is \$15.29 per hour for covered employees, and up to 15% of that amount, or \$2.29, may be in the form the covered employer's contribution to health insurance available to the covered employee.

Contractor is determined to be a covered employer under the LWO. Contractor shall execute the Living Wage Ordinance Affidavit, attached as Exhibit F; shall abide by the LWO by paying their employees a living wage; and shall post the Living Wage Poster, provided by the City Legal Department, in areas frequented by their covered employees.

IN WITNESS WHEREOF, the parties of this Agreement have hereunto set their hands.

DATE: _____

City of Bloomington
Bloomington Board of Public Works

BY:

BY:

Kyla Cox Deckard, President

Contractor Representative

Elizabeth Karon, Vice President

Printed Name

Jennifer Lloyd, Secretary

Title of Contractor Representative

John Hamilton, Mayor of Bloomington

ATTACHMENT 'A'

"SCOPE OF WORK"

Hopewell Phase I East Infrastructure Project

This project shall include, but is not limited to, the construction of new roadway, sidewalk and multiuse path, curbing, landscaping, stormwater infrastructure, and other work as required per the plans and specifications.

ATTACHMENT 'B'

**BIDDER'S AFFIDAVIT IN COMPLIANCE WITH INDIANA CODE 36-1-12-20 TRENCH SAFETY SYSTEMS;
COST RECOVERY**

STATE OF INDIANA)
) SS:
COUNTY OF _____)

AFFIDAVIT

The undersigned, being duly sworn, hereby affirms and says that:

1. The undersigned is the _____ of
(job title)
_____.
(company name)
2. The undersigned is duly authorized and has full authority to execute this Bidder's Affidavit.
3. The company named herein that employs the undersigned:
 - i. has contracted with or seeking to contract with the City of Bloomington to provide services; **OR**
 - ii. is a subcontractor on a contract to provide services to the City of Bloomington.
4. By submission of this Bid and subsequent execution of a Contract, the undersigned Bidder certifies that as successful Bidder (Contractor) all trench excavation done within his/her control (by his/her own forces or by his/her Subcontractors) shall be accomplished in strict adherence with OSHA trench safety standards contained in 29 C.F.R. 1926, Subpart P, including all subsequent revisions or updates to these standards as adopted by the United States Department of Labor.
5. The undersigned Bidder certifies that as successful Bidder (Contractor) he/she has obtained or will obtain identical certification from any proposed Subcontractors that will perform trench excavation prior to award of the subcontracts and that he/she will retain such certifications in a file for a period of not less than three (3) years following final acceptance.
6. The Bidder acknowledges that included in the various items listed in the Schedule of Bid Prices and in the Total Amount of Bid Prices are costs for complying with I.C. 36-1-12-20. The Bidder further identifies the costs to be summarized below*:

ATTACHMENT 'D'

COMPLIANCE AFFIDAVIT

REGARDING INDIANA CODE CHAPTER 4-13-18

DRUG TESTING OF EMPLOYEES OF PUBLIC WORKS CONTRACTORS

STATE OF INDIANA)
) SS:

COUNTY OF _____)

AFFIDAVIT

The undersigned, being duly sworn, hereby affirms and says that:

1. The undersigned is the _____ of
(job title)
_____.
(company name)
2. The undersigned is duly authorized and has full authority to execute this Affidavit.
3. The company named herein that employs the undersigned:
 - iii. has contracted with or seeking to contract with the City of Bloomington to provide services; **OR**
 - iv. is a subcontractor on a contract to provide services to the City of Bloomington.
4. The undersigned certifies that Contractor's submitted written plan for a drug testing program to test employees of the Contractor and Subcontractor for public works projects with an estimated cost of \$150,000 is in accordance with Indiana Code 4-13-18 as amended.
5. The undersigned acknowledges that this Contract shall be subject to cancellation should Contractor fail to comply all provisions of the statute.

Signature

Printed Name

STATE OF INDIANA)
)SS:
COUNTY OF _____)

Before me, a Notary Public in and for said County and State, personally appeared _____
and acknowledged the execution of the foregoing this _____ day of _____, 20____.

My Commission Expires: _____
Signature of Notary Public

County of Residence: _____
Printed Name of Notary Public

My Commission #: _____

ATTACHMENT 'E'

"Unit Prices"



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and Units	UNITS	UNIT PRICE	BID AMOUNT
001		STORMWATER MANAGEMENT BUDGET	1	LS	\$67,465.00	\$67,465.00
002		TEMPORARY SILT FENCE	1,475	LFT	\$2.15	\$3,171.25
003		TEMPORARY INLET PROTECTION	38	EACH	\$110.00	\$4,180.00
004		TEMPORARY SEEDING	713	LBS	\$2.75	\$1,960.75
005		MAINTENANCE OF TRAFFIC	1	LS	-	-
006		CLEARING RIGHT OF WAY	1	LS	-	-
007		WATER AND SERVICE LINE, REMOVE	298	LFT	-	-
008		ASPHALT MILLING 1.5"	324	SYS	-	-
009		PAVEMENT REMOVAL	17,660	SYS	-	-
010		CURB, REMOVE	3,398	LFT	-	-
011		SIDEWALK CONCRETE, REMOVE	895	SYS	-	-
012		SIGN, REMOVE	49	EACH	-	-
013		RETAINING WALL, REMOVE	584	LFT	-	-
014		INLET, REMOVE	13	EACH	-	-
015		MANHOLE, REMOVE	3	EACH	-	-
016		MISCELLANEOUS CONCRETE, REMOVE	42	SYS	-	-
017		PIPE, REMOVE	1,272	LFT	-	-
018		SANITARY SEWER, REMOVE	694	LFT	-	-
019		FENCE & POSTS, REMOVE	32	LFT	-	-
020		FIRE HYDRANT, ASSEMBLY, REMOVE	1	EACH	-	-
021		LIGHT POLE, REMOVE	19	EACH	-	-
022		GUARDRAIL, REMOVE	120	LFT	-	-
023		RETAINING WALL, TYPE 1	78	LFT	-	-
024		RETAINING WALL, TYPE 2	45	LFT	-	-
025		EXCAVATION, COMMON	13,135	CYS	-	-
026		SUBGRADE TREATMENT, TYPE IC (MODIFIED)	3,060	SYS	-	-
027		GEOGRID - INTERAX FILTERGRID NX750-FG	3,060	SYS	-	-
028		COMPACTED LIMESTONE SHOULDER	8	CYS	-	-
029		COMPACTED SAND	12	CYS	-	-
030		COMPACTED AGGREGATE NO. 8	265	CYS	-	-
031		COMPACTED AGGREGATE NO. 53	1055	TON	-	-

Continued on next page.



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
032		HOT MIX ASPHALT, 2, 64, SURFACE, 9.5MM	693	TON	-	-
033		HOT MIX ASPHALT, 2, 64, INTERMEDIATE, 19MM	601	TON	-	-
034		HOT MIX ASPHALT, 3, 64, BASE, 25MM	903	TON	-	-
035		SIDEWALK, CONCRETE	1,814	SFT	-	-
036		CURB, CONCRETE	2,313	LFT	-	-
037		CURB, CONCRETE, 8"	249	LFT	-	-
038		CURB, INTEGRAL CONCRETE	262	LFT	-	-
039		CURB, CONCRETE, DEPRESSED	33	LFT	-	-
040		CONCRETE ENTRANCE	385	SYS	-	-
041		PARKING BARRIER, CONCRETE	7	EACH	-	-
042		LINE, PAINT, SOLID, WHITE, 4 IN.	1,067	LFT	-	-
043		LINE, PAINT, SOLID, BLUE, 4 IN.	122	LFT	-	-
044		PAVEMENT MESSAGE MARKING, PAINT, ADA ACCESSIBLE SYMBOL	4	EACH	-	-
045		PAVEMENT MESSAGE MARKING, MULTI-COMPONENT, LANE INDICATION ARROW	8	EACH	-	-
046		SIGN POST, SQ TYP 2, UNREINF, ANCHOR BASE	120	LFT	-	-
047		SIGN POST ASSEMBLY	12	EACH	-	-
048		SIGN, SHEET, WITH LEGEND, 0.80 IN. THICKNESS	53	SFT	-	-
049		SIGN, DOUBLE-FACED, SHEET, WITH LEGEND, 0.100 IN. THICKNESS	21	SFT	-	-
050		SIGN, SHEET, WITH LEGEND, 0.100 IN. THICKNESS	9	SFT	-	-
051		MULCHED SEEDING	15,547	SYS	-	-
052		WATER MAIN, 12 IN.	1,132	LFT	-	-
053		TAPPING SADDLE 24" X 12"	1	EACH	-	-
054		TAPPING SADDLE 12" X 12"	1	EACH	-	-
055		TAPPING VALVE 12"	2	EACH	-	-
056		M.J. 12 X 12" CROSS	1	EACH	-	-
057		M.J. 12 X 12" TEE	1	EACH	-	-
058		24" X 6" HOT TAP FOR FIRE HYDRANT	1	EACH	-	-

Continued on next page.



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
059	M.J. 22.5 DEG ELBOW, 12"		10	EACH	-	-
060	M.J. 45 DEG ELBOW 12"		9	EACH	-	-
061	M.J. 90 DEG ELBOW 12"		1	EACH	-	-
062	M.J. GATE VALVE 12"		4	EACH	-	-
063	M.J. PLUG, 12"		2	EACH	-	-
064	FIRE HYDRANT ASSEMBLY		5	EACH	-	-
065	1" DOMESTIC SERVICE TAP		2	EACH	-	-
066	TEMPORARY CHLORINATION TAP		2	EACH	-	-
067	TEMPORARY BLOW-OFF ASSEMBLY		3	EACH	-	-
068	TESTING OF WATER MAINS (CBU SPECIFICATIONS)		1	LS	-	-
069	SANITARY MANHOLE (CBU STD. DET. 1)		5	EACH	-	-
070	SANITARY MANHOLE MODIFIED (CBU STD. DET. 1)		1	EACH	-	-
071	CONFLICT MANHOLE		1	EACH	-	-
072	PIPE, SANITARY SEWER, 8 IN., C-900		401	LFT	-	-
073	PIPE, SANITARY SEWER, 8 IN., SDR-35		490	LFT	-	-
074	PIPE, SANITARY SEWER, 8 IN., DUCTILE IRON		301	LFT	-	-
075	SANITARY LATERAL ASSEMBLY, 6"		11	EACH	-	-
076	PIPE, STORM SEWER, 12 IN., RCP		549	LFT	-	-
077	PIPE, STORM SEWER, 15 IN., RCP		509	LFT	-	-
078	PIPE, STORM SEWER, 18 IN., RCP		747	LFT	-	-
079	PIPE, STORM SEWER, 24 IN., RCP		319	LFT	-	-
080	PIPE, STORM SEWER, 36 IN., RCP		760	LFT	-	-
081	PIPE, STORM SEWER, 42 IN., RCP		220	LFT	-	-
082	PIPE, STORM SEWER, 6 IN., PVC		135	LFT	-	-
083	PIPE, STORM SEWER, 15 IN., PVC		34	LFT	-	-

Continued on next page.



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
084		PIPE, STORM SEWER, 12 IN., HDPE	226	LFT	-	-
085		PIPE, STORM SEWER, 15 IN., HDPE	32	LFT	-	-
086		PIPE, STORM SEWER, 18 IN., HDPE	0	LFT	-	-
087		UNDERDRAIN, 4 IN., PERFORATED	1,520	LFT	-	-
088		PIPE END SECTION, 18 IN. DIA.	1	EACH	-	-
089		NYLOPLAST DRAIN BASINS	2	EACH	-	-
090		CENTERSTONE STORMWATER DETENTION SYSTEM	1	LS	-	-
091		PLAZA STORMWATER DETENTION SYSTEM	1	LS	-	-
092		LOT 1 STORMWATER DETENTION SYSTEM	1	LS	-	-
093		LOT 5 STORMWATER DETENTION SYSTEM	1	LS	-	-
094		MANHOLE, TYPE J	4	EACH	-	-
095		MANHOLE, TYPE C	15	EACH	-	-
096		MANHOLE, TYPE K	7	EACH	-	-
097		MANHOLE, TYPE D	1	EACH	-	-
098		INLET, TYPE A	6	EACH	-	-
099		INLET, TYPE J	8	EACH	-	-
100		INLET, TYPE M	11	EACH	-	-
101		24" x 24" RECTANGULAR CONCRETE STRUCTURE	2	EACH	-	-
102		WQU - AQUA SWIRL XC-4	3	EACH	-	-
103		WQU - AQUA SWIRL XC-7	1	EACH	-	-
104		FIBER OPTIC CONDUIT	2764	LFT	-	-
105		FIBER OPTIC JUNCTION BOX	3	EACH	-	-
106		CONCRETE STEPS	20	CYS	-	-
107		UTILITY ACCESS TRENCH	13	LFT	-	-
108		FOOTING, PAVILION	22	CYS	-	-
109		LIMESTONE QUARRY BLOCK (RAMP)	1	LS	-	-
110		LIMESTONE STEPPER, TYPE A	25	EACH	-	-
111		LIMESTONE STEPPER, TYPE B	6	EACH	-	-
112		LIMESTONE STEPPER, TYPE C	3	EACH	-	-
113		LIMESTONE BLOCK CLUSTER, GROUP 1	1	LS	-	-
114		LIMESTONE BLOCK CLUSTER, GROUP 2	1	LS	-	-
115		LIMESTONE BLOCK CLUSTER, GROUP 3	1	LS	-	-

Continued on next page.



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
116		LIMESTONE, HEADWALL	1	LS	-	-
117		SST HANDRAIL AND POST	310	LFT	-	-
118		SCREEN WALL	1	LS	-	-
119		LOG SCRAMBLE	1	LS	-	-
120		ELECTRICAL, SYSTEM	1	LS	-	-
121		SIDEWALK, CONCRETE, MODIFIED	12,683	SFT	-	-
122		CONCRETE PAVEMENT, 6 IN.	1,448	SFT	-	-
123		CONCRETE PAVEMENT, 8 IN.	800	SFT	-	-
124		CURB, CONCRETE, MODIFIED	808	LFT	-	-
125		CONCRETE CONTAINMENT CURB, 8 IN.	3,855	LFT	-	-
126		CONCRETE CONTAINMENT CURB, 12 IN.	60	LFT	-	-
127		CONCRETE CONTAINMENT CURB, 24 IN.	40	LFT	-	-
128		UNIT PAVER, TYPE 1 (PEDESTRIAN)	936	SFT	-	-
129		UNIT PAVER, TYPE 2 (VEHICULAR)	88	SFT	-	-
130		UNIT PAVER, TYPE 3 (TACTILE WARNING)	2,251	SFT	-	-
131		METAL EDGE RESTRAINT, TYPE 1	72	LFT	-	-
132		METAL EDGE RESTRAINT, TYPE 2	46	LFT	-	-
133		METAL EDGE RESTRAINT, TYPE 3	46	LFT	-	-
134		PERMEABLE PAVERS, TYPE 1 (PEDESTRIAN)	23,912	SFT	-	-
135		PERMEABLE PAVERS, TYPE 2 (VEHICULAR)	47,892	SFT	-	-
136		DETECTABLE WARNING SURFACE	464	SFT	-	-
137		ARTIFICIAL TURF, STANDARD	3,154	SFT	-	-
138		ARTIFICIAL TURF, FALL RATED	1,322	SFT	-	-
139		IRRIGATION SYSTEM	1	LS	-	-
140		CISTERN PUMP AND TANK	1	LS	-	-
141		PLATFORM BENCH, TYPE 1	4	EACH	-	-
142		PLATFORM BENCH, TYPE 2 (STAGE)	1	LS	-	-

Continued on next page.



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
143	BENCH, TYPE 1		2	EACH	-	-
144	BENCH, TYPE 2		4	EACH	-	-
145	BENCH, TYPE 3		1	LS	-	-
146	SWING, STRUCTURE		2	EACH	-	-
147	FOOTBRIDGE		1	LS	-	-
148	PAVER GRATE, TYPE 1		10	EACH	-	-
149	PAVER GRATE, TYPE 2		24	EACH	-	-
150	UMBRELLA		2	EACH	-	-
151	BICYCLE RACK, TYPE 1		14	EACH	-	-
152	BICYCLE RACK, TYPE 2		8	EACH	-	-
153	DRINKING FOUNTAIN		2	EACH	-	-
154	REMOVABLE BOLLARD		14	EACH	-	-
155	BOLLARD RACK, TYPE 1		2	EACH	-	-
156	BOLLARD RACK, TYPE 2		1	EACH	-	-
157	PING PONG TABLE		2	EACH	-	-
158	PLANTING SOIL		1,397	CYS	-	-
159	PLANTER SOIL		10	CYS	-	-
160	TURF, SOD		709	SYS	-	-

Continued on next page.



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
161		DECIDUOUS TREE, SINGLE STEM, 1.25" to 2" TO 2"	42	EACH	-	-
162		DECIDUOUS TREE, SINGLE STEM, OVER 2" TO 2.5"	80	EACH	-	-
163		DECIDUOUS TREE, SINGLE STEM, OVER 2.5" TO 3.5"	5	EACH	-	-
164		DECIDUOUS TREE, MULTI-STEM, 96" TO 120"	17	EACH	-	-
165		DECIDUOUS SHRUB, 18" TO "24	484	EACH	-	-
166		CONIFEROUS, BROAD SPREADING	151	EACH	-	-
167		PLANT, ORNAMENTAL GRASS (#1)	1,029	EACH	-	-
168		PLANT,GROUND COVER	1,178	EACH	-	-
169		PLANT, PERENNIAL (#1)	3,681	EACH	-	-
170		PLANT, ANNUAL (32-CELL FLAT)	464	EACH	-	-
171		MULCH, HARDWOOD	180	CYS	-	-
172		LANDSCAPE EDGE, SPADE	638	LFT	-	-
173		LANDSCAPE EDGE, STEEL	60	LFT	-	-
174		DRY STREAM BED	945	SFT	-	-
175		SUSPENDED PAVEMENT ASSEMBLY	253	CYS	-	-
176		CONSTRUCTION LAYOUT	1	LS	-	-
177	110-01001	MOBILIZATION AND DEMOBILIZATION	1	LS	-	-
178		CONTAMINATED SOILS, STOCKPILE	18,495	TON	-	-
179	202-05546	REGULATED MATERIALS, DISPOSE, TYPE C	1,648	TON	-	-
180	202-05551	REGULATED MATERIALS, REMOVE, TYPE C	1,648	TON	-	-
181	202-05556	REGULATED MATERIALS, TRANSPORT, TYPE C	1,648	TON	-	-
182	203-02010	EXCAVATION, ROCK	100	CYS	-	-
183		RAISED PAVEMENT MARKER	3	EACH	-	-
184		SITE FURNISHING ANCHOR	62	EACH	-	-
186		BUILDING TRADE PARK SIGN, REMOVAL	1	LS	-	-

BID:



Project Title : Hopewell Phase I East Infrastructure Project

LINE	ITEM	DESCRIPTION	Approximate Quantity and	UNITS	UNIT PRICE	BID AMOUNT
ALTERNATE #1 - SECTION 32 3300 - SITE FURNISHINGS						
A1-1	PAVILION		1	LS	_____ - ____	_____ - ____
						TOTAL ALTERNATE #1: _____ - ____
ALTERNATE #2 - SECTION 32 3300 - SITE FURNISHINGS						
A2-1	PAVILION, INSTALLATION		1	LS	_____ - ____	_____ - ____
						TOTAL ALTERNATE #2: _____ - ____
ALTERNATE #3 - SECTION 32 9200 - Turf and Grasses						
A3-1	EXTENDED MAINTENANCE PERIOD, SOD		1	LS	_____ - ____	_____ - ____
ALTERNATE #3 - SECTION 32 9300 - PLANTS						
A3-2	EXTENDED MAINTENANCE PERIOD, PLANTS		1	LS	_____ - ____	_____ - ____
						TOTAL ALTERNATE #3: _____ - ____

Bidder acknowledges that:

1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

EXHIBIT "F"

AFFIDAVIT THE LIVING WAGE ORDINANCE

The undersigned, being duly sworn, hereby affirms and says that:

1. The undersigned is the [Click here to enter text.](#) of [Click here to enter text.](#)
(job title) (company name)
2. The company named herein that employs the undersigned has contracted with or is seeking to contract with the City of Bloomington to provide services.
3. The undersigned hereby states that, to the best of their knowledge and belief, the company named herein is subject to Bloomington City Ordinance 2.28, otherwise known as the "Living Wage Ordinance."
4. The projected employment needs under the award include the following: [Click here to enter text.](#)
5. The projected net increase or decrease in jobs for covered employees by job title that will result from awarding the assistance: [Click here to enter text.](#)
6. The undersigned hereby affirms that the smallest hourly wage to be earned by each of their covered employees shall be at least the living wage.

I affirm under the penalties of perjury that the foregoing facts and information are true and correct to the best of my knowledge and belief.

Signature

Printed name

STATE OF INDIANA)
) SS:
COUNTY OF _____)

Before me, a Notary Public in and for said County and State, personally appeared _____
_____ and acknowledged the execution of the foregoing this _____ day of _____, 2023.

My Commission Expires: _____

Notary Public

County of Residence: _____

Name Printed

Commission Number

SECTION IX

SPECIFICATIONS

Indiana Department of Transportation Standard Specifications dated 2022 and current supplements thereto, to be used with this project.