



PROJECT MANUAL
FOR
MIRACLE OF HICKORY PARK MODIFICATION

PROJECT NUMBER: 27-006
CITY OF HICKORY, NORTH CAROLINA

ADVERTISEMENT DATE: AUGUST 26, 2026

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I. INVITATION TO BID

A. INVITATION TO BID

The City of Hickory (the “Owner” or “City”) hereby invites sealed bids for the following Project:

PROJECT NAME:	Miracle of Hickory Park Modification
PROJECT NUMBER:	27-006
PRE-BID MEETING:	September 9, 2026, 11:00 AM
BID QUESTION DEADLINE:	September 16, 2026, by 4:00 PM
BID DUE DATE AND TIME:	September 23, 2026, by 2:30 PM
BID LOCATION:	City of Hickory Engineering Department 76 N. Center Street, Hickory, NC 28602
BID OPENING:	
SCOPE OF WORK:	This Project consists of the following: Construction and/or installation including project management, coordination, scheduling, staking & technical layout, site clearing & grubbing, selective demolition, erosion control, earthwork (mass grading and fine grading), storm drainage, water and sanitary sewer services, concrete pavement, asphalt pavement, sidewalks, curb work, prefabricated restroom building, accessible stage, and ancillary work illustrated in the contract documents.

II. INSTRUCTIONS TO BIDDERS

A. INSTRUCTIONS TO BIDDERS**1.0 DEFINITIONS**

- 1.1 **Addendum or Addenda.** Written or graphic instruments issued by the Owner prior to the submission of Bids which modify or interpret the Bidding Documents by additions, deletions, clarifications, corrections or other type of modifications. Bidders, upon receiving Addenda, shall insert same into the Bid Documents.
- 1.2 **Additive or Deductive Bid Item (Alternate Bid).** An amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted by the Owner.
- 1.3 **Alternate.** An amount stated in a Bid for a specific material, product or good that can be added or deducted from the Base Bid by the Owner if the defined changes are made to the Plans or Specifications.
- 1.4 **Authorized Representative.** The firm or individual nominated by the Owner to act on behalf of the Owner, e.g., Engineer and/or Architect of Record, City Project Manager or others as designated by Owner.
- 1.5 **Award.** The Owner's acceptance of the successful Bidder's proposal, upon authorization of the Hickory City Council.
- 1.6 **Base Bid.** The sum stated in the Bid for which the Bidder offers to perform the work is described in the Bidding Documents as the base, to which work may be added or from which work may be deducted for sums stated in Additive or Deductive Bid Items.
- 1.7 **Bid.** A complete and properly signed offer to do the Work or designated portion thereof for the sums stipulated therein submitted in accordance with the Bidding Documents.
- 1.8 **Bid Documents.** All documents and forms are contained in this Project Manual.
- 1.9 **Bid Security.** The security furnished with a Bid to guarantee that the Bidder will enter into the Contract if its Bid is accepted by the Owner. Bid Security shall only be required on construct or repair work requiring an estimated expenditure of public money in an amount equal to or more than \$500,000 or purchase of apparatus, supplies, materials, or equipment requiring an estimated expenditure of public money in an amount equal to or more than \$90,000.
- 1.10 **Bidder.** Any individual, partnership, firm, corporation or other business entity acting directly through a duly authorized representative, who submits a bid for the Work contemplated.
- 1.11 **Calendar Day.** Every day shown on the calendar. Any reference to the word "day" or "days" shall mean calendar day or calendar days, respectively, unless otherwise expressly provided.
- 1.12 **Change Order.** A written order to the Contractor covering changes in the Plans, Specifications, Contract Item quantities, or Work and establishing the basis of payment and Contract Time adjustment, if any, for the Work affected by such changes.
- 1.13 **Claim.** A demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes

- other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract.
- 1.14 **Contract Documents or Contract.** The executed agreement between the Owner and the successful bidder, covering the performance of and compensation for the Work. The term Contract is all inclusive with reference to all written agreements affecting a contractual relationship and all documents referred to therein. The Contract shall include, but not be limited to the Invitation to Bid, Instructions to Bidders, Bid Form and Supplements, Contract Requirements and Forms, required certificates and affidavits, bonds, addenda, technical specifications and plans. The Contract shall constitute one instrument.
- 1.15 **Contract Item or Pay Item.** A specific unit of Work for which a price is provided in the Contract.
- 1.16 **Contract Time.** The number of calendar days or working days, stated in the proposal, allowed for completion of the Contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the Contract shall be completed by that date.
- 1.17 **Contractor.** The successful Bidder with whom the City of Hickory contracts for the Work.
- 1.18 **Date of Final Completion (may also be referred to as Final Acceptance).** The date of completion of all Work required by, and in strict compliance with, the Contract, including start up, testing, obtaining regulatory approvals from all applicable authorities, and all preparations necessary to operate and maintain the Project
- 1.19 **Engineer.** The individual, partnership, firm or corporation duly authorized by the Owner to be responsible for engineering inspection of the contract work and acting directly or through an authorized representative.
- 1.20 **Inspector or Project Inspector.** An authorized representative of the Engineer assigned to make all necessary inspections and/or tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.
- 1.21 **Invitation to Bid (ITB).** A public announcement, as required by local law, inviting Bids for Work.
- 1.22 **Notice To Proceed (NTP).** A written notice to the Contractor to begin the Work on a specified date.
- 1.23 **Owner.** The City of Hickory. For the purpose of this Project Manual, the Owner may also be referred to as the City.
- 1.24 **Payment Bond.** The approved form of security furnished by the Contractor and its surety as a guaranty that it will pay in full all bills and accounts for materials and labor used in the construction of the Work.
- 1.25 **Performance Bond.** The approved form of security furnished by the Contractor and his surety as a guarantee that the Contractor will complete the Work in accordance with the terms of the Contract.
- 1.26 **Plans.** The official drawings or exact reproductions, approved by the Owner, which show the location, character, dimensions and details of the Work to be done and which are to be considered as part of the Contract.

- 1.27 **Project.** Miracle of Hickory Park Modification Project Number 27-006.
- 1.28 **Specifications.** The written directions and requirements for completing the Work. Standards for specifying materials or testing which are cited in the specifications by reference shall have the same force and effect as if included in the Contract physically.
- 1.29 **Substantial Completion.** The stage of completion of the Project, including testing, approval by any applicable regulatory authority, and receipt of all the certificates of occupancy and other permits, approvals, licenses, and other documents from all governmental authorities that are necessary for the beneficial occupancy and use of the portion to be occupied or utilized such that the Work and the Project are functionally and legally usable by the Owner for the purpose for which they are intended.
- 1.30 **Surety.** The corporation, partnership, or individual, other than the Contractor, executing a Bid Payment, Performance or Guaranty Bonds that are furnished to the Owner by the Contractor.
- 1.31 **Work.** The furnishing of all labor, materials, tools, equipment, and incidentals necessary to the Contractor's performance of all duties and obligations imposed by the Contract.

2.0 CONTRACT TIME

The date of commencement of the Work shall be fixed by issuance of a written Notice to Proceed from the Owner to the Contractor. The Contract Time shall be measured from the date of commencement. Contractor shall achieve Substantial Completion of the Work not later than **180** calendar days from the date of commencement. Contractor shall then achieve Final Completion and Acceptance of the Work, including all required final submittals, not later than **210** calendar days from the date of Substantial Completion. Contractor shall notify the Owner in writing at least 48 hours in advance of the time actual construction operations will begin.

3.0 LIQUIDATED DAMAGES

The Contract Time referred to above includes phases of construction as described below. By submitting a bid, the Contractor acknowledges and agrees that the Owner is authorized to deduct and retain out of the monies due to the Contractor and/or the Contractor is liable to the Owner for liquidated damages for the Project as set out below for each and every day or any portion thereof the time employed upon said work or delivery may exceed the time stipulated for such performance and completion. The term "day", when used in connection with liquidated damages, shall in all instances include any portion of a day that the work is not timely completed. The sum per calendar day is fixed in view of the difficulty of estimating such damages that the Owner will suffer by reason of such default. The liquidated damages amount will not be capped, and the assessment of liquidated damages does not preclude the award of other damages that may be authorized under other applicable provisions of the Contract for reasons other than delayed performance. Failure to achieve Substantial Completion within the Contract Time: **\$500** per calendar day.

4.0 GOVERNING ORDER OF BIDDING AND CONTRACT DOCUMENTS

Addenda, Change Orders and Supplementary Agreements will take precedence over other Contract Documents. Detailed provisions shall have precedence over general provisions. Bidders shall take no advantage of any apparent error or omission in the Bid Documents or Contract

Documents. In the event a Bidder discovers an error or omission, the Bidder shall immediately notify the Owner. The Owner will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the Bid Documents.

5.0 BIDDER REPRESENTATIONS

5.1 Each Bidder by making its Bid represents that it:

- A. Has examined the site of the proposed Work and the Bidding Documents; and
- B. Is satisfied as to the character, quality, and quantities of work to be performed, materials to be furnished and as to the requirements of the proposed Contract; and
- C. Acknowledges that submission of a Bid shall be prima facie evidence that the Bidder has made such examination and is satisfied as to the conditions to be encountered and has adequate time to perform the Work in accordance with the requirements of the Contract Documents.
- D. Warrants and certifies that as of the date of this Bid, Bidder is not identified on the Final Divestment Lists created by the North Carolina State Treasurer pursuant to N.C.G.S. 147 Articles 6e or 6g. The person signing this Bid certifies that he or she is authorized by the Bidder to make the foregoing certification. Bidder further agrees that it will not take any action during the term of this contract that would provide a basis for it to be placed upon the Final Divestment Lists nor will it utilize on this Contract any subcontractor that is identified on the Final Divestment Lists.

5.2 Bidders for this Work shall be qualified and licensed for this particular Work by the State of North Carolina prior to time of Bid Opening. North Carolina License type, number and dollar limit must be indicated where requested for the Bidder.

5.3 Bidders shall have previous acceptable experience, of current personnel, in the construction of at least two (2) projects in the last ten (10) years that demonstrate the ability to accomplish the Work required by this Contract. If the Bidder is a recently formed entity, then the previous experience of the component entities will be considered. The Owner shall be the sole judge of acceptable previous experience. The Bidder shall have regularly and principally engaged in work of the quality and scope indicated by the Contract Documents, utilizing administrators and supervisors regularly employed by the Bidder for managing the Work, and utilizing workers regularly employed by the Bidder for construction not performed by subcontractors.

5.4 In the event that a Bidder is discovered to be ineligible after a Contract is awarded, and the Project requires Bid Security, the ineligible bidder shall indemnify the Owner against any losses suffered by the Owner because of the Bidder's ineligibility. The Owner reserves the right to take any steps it believes appropriate to lessen its actual or potential loss, including termination of the Contract or withholding payments sufficient to cover losses.

5.5 Bidder shall abide by the confidentiality requirements set forth in Section 11 of the Instruction to Bidders.

5.6 Bidder shall comply with all federal, state and local laws and regulations relating to the preparation and submission of the Bid including, without limitation, E-Verify, and shall submit to Owner all required certifications, verifications, permits and licenses.

6.0 BID DOCUMENTS**6.1 Documents**

Bidders may obtain complete sets of the Bid Documents as indicated in the Advertisement in the number desired and for the cost stated therein.

Bidders shall use complete sets of Bid Documents in preparing Bids. The Owner assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bid Documents.

The Owner, by making copies of the Bid Documents available on the above terms, does so only for the purpose of obtaining Bids on the Work and does not confer a license or grant for any other use.

6.2 Interpretation or Correction of Bidding Documents

Bidders shall take no advantage of any apparent error or omission in the Bid Documents. In the event a Bidder discovers any apparent error or omission, the Bidder shall immediately notify the Owner. The Owner will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the Bid Documents through the issuance of an Addendum. Any Addendum or clarification supplementing the Bid Documents, the Plans, and the Specifications, issued prior to the date and time set for the submittal of Bid Proposal shall be made part of the Contract.

Bidders requiring clarification or interpretation of the Bid Documents shall make a written request for clarification and forward the same to the appropriate address below. The Owner will only respond to written questions. Any interpretation, correction or change of the Bid Documents will be made only by an Addendum. Interpretations, corrections or changes of the Bid Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections and changes.

Written requests for clarification must be submitted electronically to Sam Abernethy, PE at sabernethy@hickorync.gov. The deadline for submitting written requests for clarification is **September 16, 2026, by 4:00 PM**.

All questions must be submitted no later than the date and time stated above. Any questions received after that time may not be addressed prior to the bid due date.

The point of contact for all submissions and correspondence regarding this ITB is Sam Abernethy who can be contacted at sabernethy@hickorync.gov.

6.3 Standards of Quality and Performance, Brand Names and Equivalent Products

Descriptions of materials, products and equipment used in these specifications are to acquaint bidders with the types of products desired and will be used as a standard by which goods and services offered as equivalent will be evaluated. Where the specifications do not include a performance or design standard it is due to the determination that the information is impossible or impractical to provide. In such instances, the specifications include at least three brand names to illustrate the standard by which products offered as equivalent will be evaluated. Where three brand names could not be identified, the specifications include as many as possible. These

references are only to denote the quality of product required and do not limit or restrict submission of equivalent products by the bidder. Equivalent products can be submitted for consideration as set forth below.

Materials, products, and equipment specified in Bid and Contract documents are used to set forth and convey to bidders the general style, type, function, dimension, and quality of product desired by the Owner.

Any request by Contractor for material substitution of "an equal" item must be received by the Architect / Engineer or Owner at least ten (10) days prior to receipt of Bids.

Prior to proposing any substitute item, Contractor shall satisfy itself that the item proposed is, in fact, equal to item originally specified, that such item will fit into the space allocated, that such item affords comparable ease of operation, maintenance and service, that the appearance, longevity and suitability for the climate are comparable, and that by reason of cost savings, reduced construction time, or similar demonstrable benefit, the substitution of such item will be in Owner's interest.

The burden of proof of equality of a proposed substitution for a specified item shall be upon Contractor. Contractor shall support its request with sufficient test data and other means to permit Owner to make a fair and equitable decision on the merits of the proposed substitution. Any item by a manufacturer other than those specified or of brand name or model number or of generic species other than those specified will be considered a substitution. Architect / Engineer of Record or Owner may be the sole judge of whether or not the substitution is equal in quality, utility and economy to that specified.

Materials and methods proposed as substitutions for specified items shall be supported by certification of their approval for use by any or all government agencies having jurisdiction over use of the specific material or method.

Substitutions may not be permitted in those instances where the products are designed to match artistic design, specific function or economy of maintenance.

Approval of a substitution shall not relieve Contractor from responsibility for compliance with all requirements of the Contract. Contractor shall bear the expense for any changes in other parts of the Work caused by any substitutions. If Owner rejects Contractor's proposed substitution, Contractor may not make any additional requests for substitution in the same category. If the proposed substitution is approved, such approval will be set forth in an Addendum.

If a substitution is installed without prior knowledge and written approval by the Owner, the Contractor will bear all costs associated with removal and replacement of the same at the Owner's request.

6.3.1 Addenda

Addenda will be available through the Bid Portal. The Bidder shall acknowledge receipt of Addenda by completing the acknowledgment space on the Bid Form.

7.0 **BIDDING PROCEDURE**

7.1 Form and Style of Bids

Bids shall consist of the entire Project Manual including the following forms:

- (1) Itemized Bid Form
- (2) Execution of Bid - Non-collusion Affidavit, Debarment Certification and Gift Ban Certification
- (3) Bid Bond (if required, see Definitions, Section 1.9, Bid Security)

Any bid submitted without these forms may be deemed non-responsive.

The Owner reserves the right to reject any or all bids, waive informalities, and/or accept such bid as appears in its judgement to be in the best interest of the City of Hickory.

Changes or additions to the Bid, recalculations or changes in the work bid upon, alternative proposals, or any other modifications of the Bid Form which are not specifically called for in the Bid Documents may result in the Owner's rejection of the Bid as non-responsive to the Invitation to Bid.

The Bidder must execute all pages of the Bid Form, in their entirety. All blanks on the Bid Form shall be filled in by typewriter or manually in ink.

Unit prices shall include the cost for materials, equipment, tools, labor, sales tax and all incidentals necessary for proper execution and completion of the Work. As the quantities represented are estimates, quantity adjustments will be made as necessary during the project.

In the event there are unit price Bid Items provided in the Bid Form or its attachments, and the "amount" indicated for a unit price Bid Item does not equal the product of the unit price and quantity, the unit price shall govern, and the amount will be corrected accordingly. In the event there is more than one Bid Item in the Bid Form or its attachments, and the total indicated therein does not agree with the sum of the prices bid for the individual items, the prices bid on the individual items shall govern and the total for the schedule will be corrected accordingly. Where so indicated by the make-up of the Bid Form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the amount written in words shall govern.

All requested, Additive or Deductive Bid Items shall be bid. If no change in the Base Bid is required, enter "No Change."

No person, firm or corporation shall be allowed to submit (or have an interest in) more than one prime Bid for the same work. For example, a company may not submit one bid for itself and one bid for a joint venture in which it will participate. However, a person, firm or corporation that has submitted a sub-bid to a Bidder is not, however, disqualified from submitting a sub-bid or quoting prices to other Bidders or submitting a prime Bid.

7.2 Sales and Use Tax

The Owner is NOT exempt from applicable sales or use taxes assessed by North Carolina or other states. However, the North Carolina Department of Revenue does reimburse the Owner for the North Carolina sales or use taxes the Owner pays for certain construction related goods. Therefore, the Owner utilizes the below procedures for such sales tax. The Contractor agrees to follow the procedures set forth below for all sales or use taxes related to the Work and any other work performed pursuant to this Contract.

Eligible Taxes are defined as North Carolina sales or use taxes paid by the Contractor for buildings, materials, supplies, fixtures and equipment that become a part of or annexed to any building or structure that is owned or leased by the Owner and is being erected, altered or repaired by the Owner (North Carolina GS 105-164-14(c)).

Non-Eligible Taxes are defined as all other sales or use taxes including those paid to states other than North Carolina, or sales or use taxes paid to North Carolina on purchases or rental of tools, equipment, and disposable supplies, including fuel, used in the Work.

Non-Eligible Taxes

Non-Eligible Taxes shall be included in the Bid and will be included in the Contract Price.

The Contract Price as shown on the bid form includes full and complete compensation for the Contractor for any and all Non-Eligible Taxes paid by the Contractor in the prosecution of the Work and any other work performed pursuant to this Contract.

Eligible Taxes

Eligible Taxes shall not be included in the Bid and will not be included in the Contract Price. Eligible Taxes will be reimbursed separately pursuant to the procedures below.

Prior to award of the Contract, the Contractor shall provide the Owner with the estimated amount of total Eligible Taxes for the Contract. This estimated amount of total Eligible Taxes will be used solely for the purpose of the Owner's budget planning for the Project and will not be included in the Contract Price.

The Contract Price as shown on the bid form excludes Eligible Taxes. The Contractor shall invoice the Owner for Eligible Taxes as set forth below and the Owner will reimburse the Contractor for those Eligible Taxes pursuant to the procedures below.

In the event the Contractor fails to materially follow the procedures set forth by this Article, and/or fails to properly document its payment of Eligible Taxes, the Owner will not be liable to the Contractor in any way for the payment of such Eligible Taxes.

In order to receive the reimbursement for Eligible Taxes, the Contractor shall provide a detailed listing of Eligible Taxes on the Sales/Use Tax Statement ("Tax Statement") provided in the Contract Documents. Tax Statements must be submitted with each payment request and shall include invoices documenting the Eligible Taxes and the underlying purchases made by the Contractor or by the Contractor's subcontractor.

Tax Statements must indicate whether such Eligible Taxes was paid by the Contractor or by the Contractor's subcontractor.

If no Eligible Taxes have been paid for the period in which a payment request is being submitted by the Contractor, then the Contractor shall indicate "No Eligible Taxes paid this period" and submit the Tax Statement accordingly.

Tax Statements must be completed and signed by the Contractor/subcontractor's company officer submitting the statement and certified by a Notary Public.

Tax Statement must list in detail the Eligible Taxes paid for each individual invoice paid by the Contractor/subcontractor. No lump sum, running total, or copies of previously reported statements will be accepted.

Tax Statements must show separately the portion of Eligible Taxes that are paid to the State of North Carolina and the applicable North Carolina county, identifying the county accordingly.

Tax Statements will be reviewed and approved by the Owner prior to paying the Eligible Taxes reimbursement. Such approval will not be unreasonably withheld.

7.3 E-Verify

Bidder is required to comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes. Further, if Bidder utilizes a subcontractor, Bidder shall require the subcontractor to comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes.

7.4 Iran and Companies that Boycott Israel Divestment Acts

NC Prohibitions on Contracts with Companies that Invest in Iran or Boycott Israel. Bidder warrants and certifies that it is not identified on the Final Divestment Lists created by the NC State Treasurer pursuant to N.C.G.S. 147 Articles 6e or 6g. Bidder further warrants and certifies it will not take any action during the term of this contract that would provide a basis for it to be placed upon the Final Divestment Lists nor will it utilize on this Contract any subcontractor that is identified on the Final Divestment Lists. In signing this Contract, Bidder further agrees, as an independent obligation, separate and apart from this Contract, to reimburse the Owner for any and all damages, costs and attorneys' fees incurred by the Owner in connection with any claim that this Contract or any part thereof is void due to Bidder appearing on the Final Divestment Lists.

7.5 Bid Security

Each Bid requiring a Bid Security shall be accompanied by a Bid Security in the form of, at Bidder's option, cashier's check, certified check, money order or bid bond (in favor of the Owner) in the amount of 5% of the Base Bid amount pledging that the Bidder will after notice of award, enter into a Contract with the Owner on the terms stated in its Bid and will furnish bonds as described in Contract Documents, covering the faithful performance of the Contract and the payment of all obligations arising thereunder.

The Bid Bond shall be written on standard Surety Bid Bond form by a firm licensed to provide such forms in the State of North Carolina, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of his power of attorney.

The Owner will have the right to retain the Bid Security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn, or (c) all Bids have been rejected.

7.6 Submission of Bids

Bidders must submit their Bid **City of Hickory, Engineering Department, 76 N. Center Street, Hickory, NC 28602.**

The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids. Oral, telephonic or telegraphic Bids are invalid and will not receive consideration. Bids received after the time and date for receipt of Bids will be returned to Bidder unopened.

No responsibility will be attached to the Owner for premature opening of or failure to open a Bid not properly identified.

7.7 Modification or Withdrawal of Bid

After opening, each Bid is a firm offer by the Bidder to contract which may not be withdrawn for 120 Calendar Days from bid opening.

Prior to bid opening, any Bid submitted may be withdrawn by notice to the Owner. For withdrawal to be effective, the Owner must actually receive the notice prior to bid opening. Such notice shall be in writing over the signature of the Bidder, and it shall be worded so that it does not reveal the amount of the original Bid.

Withdrawn Bids may be modified and resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

8.0 **CONSIDERATION OF BIDS**

8.1 Basis of Award

It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive abnormalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

8.2 Opening of Bids

The Bids received on time will be opened publicly and will be read aloud. An abstract of the Bids may be made available to Bidders. There will be no post-bid opening meetings.

8.3 Alternates

The Owner shall have the right to request Alternates in addition to the base bid and the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bid Documents. Determination of the low Bidder will be made on the basis of the sum of the Base Bid and any Alternates accepted. When an Alternate is a request for a preferred brand, such request is made pursuant to North Carolina General Statute 133-3. The performance standards that support the preferences are set forth below and were communicated during the pre-bid meeting. The Owner has selected each of the preferred brand Alternates set forth on the bid submission form and in the specifications based on the following:

1. The brand requested provides a cost savings the Owner; and
2. The brand requested maintains or improves the system/process affected by the preference.

8.4 Rejection of Bids

The Owner reserves the right to reject any and or all Bids.

- A. Notwithstanding any of the above, the Owner reserves the right to reject any or all Bids and to waive any informality or technicality. Being the low Bidder does not mean that the Contract is required to be awarded to said Bidder or that the Contract will be awarded at all.
- B. Bids may be considered non-responsive for reasons such as but not limited to the following:
 - 1. If the Bid is on a form other than that furnished by the Owner, or if the Owner's form is altered, or if any part of the Bid Form is detached.
 - 2. If there are unauthorized additions, known substitutions, conditional or alternate pay items, or irregularities of any kind which make the Bid incomplete, indefinite, or otherwise ambiguous.
 - 3. If the Bid does not contain a unit price for each pay item listed in the Bid, except in the case of authorized alternate pay items, for which the Bidder is not required to furnish a unit price.
 - 4. If the Bid is not accompanied by the Bid Bond specified by the Owner.
 - 5. Failure of authorized person to sign Bid Form.
 - 6. Failure to submit necessary forms per this Instruction to Bidders.
- C. A Bidder may be considered disqualified for any of the reasons such as but not limited to the following:
 - 1. Submitting more than one Bid from the same partnership, firm, or corporation under the same or different name.
 - 2. Evidence of collusion among Bidders. Bidders participating in such collusion shall be disqualified as Bidders for any future work of the Owner until any such participating Bidder has been reinstated by the Owner as a qualified Bidder.

9.0 AWARD OF CONTRACT

The Contract will be awarded in accordance with award criteria as soon as possible from bid opening and the successful low bidder will receive a written notice of award. Contract work may not proceed until the properly executed Contract, and all required submittals are delivered to the Owner in acceptable form and the Owner has executed the Contract. The Contract Time will commence in accordance with a Notice to Proceed issued by the Owner and will not be extended due to delays by the Contractor in delivering required documents.

10.0 SUBMITTALS

The successful bidder shall, within ten days after notice of award, furnish to the Owner any submittals required by the Contract Documents or requested by the Owner to be submitted, including the following:

- A. The executed Contract;
- B. A detailed breakdown of any compound unit prices;
- C. Performance and payment bonds;
- D. Upon Owner's request, form copies of subcontractors Contractor will use on this Project;
- E. Baseline Schedule as defined by General Conditions Section 10;
- F. Certificates of Insurance;
- G. A statement of the required experience;

- H. The names of manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work;
- I. A designation of the Work to be performed with the Bidder's own forces; and
- J. The names of persons or entities who are to furnish the principal portions of the Work.

11.0 FINANCIAL

11.1 Audit Rights

The Owner shall have the right to inspect, examine and make copies of any and all books, accounts, records, and other writings of contractors relating to the performance of the Work under the Contract, including change orders. Such audit rights shall be extended to any duly authorized representatives designated by the Owner. Audits shall take place at times and locations mutually agreed upon by both parties, but not later than one week following the date of a request for an audit.

11.2 Subcontractor Payments

Bidders are advised of the subcontractor payment requirements described in North Carolina General Statutes ("NCGS") 22C-2 "Performance by Subcontractor" and 22C-3 "Time of Payment to Subcontractor."

NCGS 22C-2 prohibits as a matter of public policy the insertion of "Pay-When-Paid" clauses in subcontractor agreements. A contractor may not condition subcontractor payments on the contractor's receipt of payments from the owner.

NCGS 22C-3 requires contractors to pay subcontractors for work performed in accordance with contract requirements within seven days of contractor's receipt of a period or final payment from the owner.

12.0 CONFIDENTIALITY REQUIREMENTS

12.1 Bidder hereby agrees to comply with all confidentiality requirements set forth in this section in connection with this Project.

12.2 Confidential Information

Confidential Information includes any information, not generally known in the relevant trade or industry, obtained from the Owner or its vendors or licensors or which falls within any of the following general categories:

- A. Trade secrets. For purposes of this Contract, trade secrets consist of information of the Owner or any of its suppliers, contractors or licensors: (a) that derives value from being secret; and (b) that the owner has taken reasonable steps to keep confidential. Examples of trade secrets include information relating to proprietary software, new technology, new products or services, flow charts or diagrams that show how things work, manuals that tell how things work and business processes and procedures.
- B. Information of the Owner or its suppliers, contractors or licensors marked "Confidential" or "Proprietary."
- C. Information relating to criminal investigations conducted by the Owner, and records of criminal intelligence information compiled by the Owner.

- D. Information contained in the City/County's personnel files, as defined by N.C. Gen. Stat. 160A-168. This consists of all information gathered and/or maintained by the Owner about employees, except for that information which is a matter of public record under North Carolina law.
- E. Citizen or employee social security numbers collected by the Owner.
- F. Computer security information of the Owner, including all security features of electronic data processing, or information technology systems, telecommunications networks and electronic security systems. This encompasses but is not limited to passwords and security standards, procedures, processes, configurations, software and codes.
- G. Local tax records of the Owner that contains information about a taxpayer's income or receipts.
- H. Any attorney / Owner privileged information disclosed by either party.
- I. Any data collected from a person applying for financial or other types of assistance, including but not limited to their income, bank accounts, savings accounts, etc.
- J. The name or address of individual homeowners who, based on their income, have received a rehabilitation grant to repair their home.
- K. Building plans of Owner-owned buildings or structures, as well as any detailed security plans.
- L. Billing information of customers compiled and maintained in connection with the Owner providing utility services.
- M. Other information that is exempt from disclosure under the North Carolina public records laws.

Categories 11.2(C) through 11.2(M) above constitute "Highly Restricted Information," as well as Confidential Information. The Company acknowledges that certain Highly Restricted Information is subject to legal restrictions beyond those imposed by these requirements, and agrees that: (a) all requirements set forth herein applicable to Confidential Information shall apply to Highly Restricted Information; and (b) the Contractor will also comply with any more restrictive instructions or written policies that may be provided by the Owner from time to time to protect the confidentiality of Highly Restricted Information.

12.3 Restrictions

The Contractor shall keep the Confidential Information in the strictest confidence, in the manner set forth below:

- A. It shall not copy, modify, enhance, compile or assemble (or reverse compile or disassemble), or reverse engineer Confidential Information.
- B. It shall not, directly or indirectly, disclose, divulge, reveal, report or transfer Confidential Information of the Owner to any third party or to any individual employed by the Contractor, other to know such Confidential Information, and (ii) has executed a confidentiality agreement incorporating substantially the form of this Section and containing all protections set forth herein.
- C. It shall not use any Confidential Information of the Owner for its own benefit or for the benefit of a third party, except to the extent such use is authorized by Owner as set forth herein, or is for the purpose for which such Confidential Information is being disclosed.
- D. It shall not remove any proprietary legends or notices, including copyright notices, appearing on or in the Confidential Information of the Owner.

- E. The Contractor shall use its best efforts to enforce the proprietary rights of the Owner and the Owner's vendors, licensors and suppliers (including but not limited to seeking injunctive relief where reasonably necessary) against any person who has possession of or discloses Confidential Information in a manner not permitted by Owner.
- F. In the event that any demand is made in litigation, arbitration or any other proceeding for disclosure of Confidential Information, the Contractor shall assert these provisions as grounds for refusing the demand and, if necessary, shall seek a protective order or other appropriate relief to prevent or restrict and protect any disclosure of Confidential Information.
- G. All materials which constitute, reveal or derive from Confidential Information shall be kept confidential to the extent disclosure of such materials would reveal Confidential Information, and unless otherwise agreed, all such materials shall be returned to the Owner or destroyed upon satisfaction of the purpose of the disclosure of such information.

12.4 Exceptions

The parties agree that the Contractor shall have no obligation with respect to any Confidential Information which the Contractor can establish:

- A. Was already known to the Contractor prior to being disclosed by the disclosing party;
- B. Was or becomes publicly known through no wrongful act of the Contractor;
- C. Was rightfully obtained by the Contractor from a third party without similar restriction and without breach hereof;
- D. Was used or disclosed by the Contractor with the prior written authorization of the Owner;
- E. Was disclosed pursuant to the requirement or request of a governmental agency, which disclosure cannot be made in confidence, provided that, in such instance, the Contractor shall first give to the Owner notice of such requirement or request;
- F. Was disclosed pursuant to the order of a court of competent jurisdiction or a lawfully issued subpoena, provided that the Contractor shall use its best efforts to obtain an agreement or protective order providing that, to the greatest extent possible, the confidentiality requirements set forth herein will be applicable to all disclosures under the court order or subpoena.

12.5 Unintentional Disclosure

Notwithstanding anything contained herein to the contrary, in the event that the Contractor is unintentionally exposed to any Confidential Information of the Owner, the Company agrees that it shall not, directly or indirectly, disclose, divulge, reveal, report or transfer such Confidential Information to any person or entity or use such Confidential Information for any purpose whatsoever.

12.6 Remedies

The Contractor acknowledges that the unauthorized disclosure of the Confidential Information of the Owner will diminish the value of the proprietary interests therein. Accordingly, it is agreed that if the Contractor breaches its obligations hereunder, the Owner shall be entitled to equitable relief to protect its interests, including but not limited to injunctive relief, as well as monetary damages.

III. BID FORMS AND SUPPLEMENTS

A. ITEMIZED BID**BASE BID**

The undersigned Bidder, having carefully examined the Bidding and Contract Documents, and having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment, permits and services, including all scheduled Allowances, necessary to complete the Work for the abovenamed project, in accordance with the requirements of the Bidding Documents, for the sum of:

_____ Dollars (\$ _____)

UNIT PRICES

Line Item	Sheet/Detail or Spec No.	Description	Qty	Unit	Unit Price	Extended Price
1	A1.0	Restroom Building	1	LS		
2	A1.1	Accessible Stage	1	LS		
3		Mobilization, incl. Surveying	1	LS		
4	C100	Comprehensive Demolition	1	LS		
5	C301	Comprehensive Grading	1	LS		
6	1/C500	Temporary Silt Fence	375	LF		
7	5/C500	Silt Sock	140	LF		
8	6/C500	Silt Fence Outlet / Stone Opening	2	EA		
9	4/C500	Tree Protection Barricade	75	LF		
10	2/C500	Temp. Seeding & Mulching	0.28	AC		
11	3/C500	Silt Sack Inlet Protection	1	EA		
12	6/C501	Painted Accessible Pedestrian Striping	344	SF		
13	2/C501	Concrete Curb & Gutter, incl. Sloped Ends & Tapers (match existing)	98	LF		
14	1/C501	Asphalt Surface Course, Type S9.5B	321	SY		
15	1/C501	Asphalt Intermediate Course, Type I-19.0C	149	SY		
16	3/C501	4" Concrete Sidewalk, 3000 PSI	244	SY		
17	32 17 23	Parking Lot Striping, Thermoplastic Pavement Markings, 4", 90 mils	72	LF		
18	5/C501	Accessible Parking - Ramp / Signage / Striping / Symbols	1	LS		
19	C400	Water and Sewer Site Utilities, incl. all costs to include all utilities as shown in Project Drawings	1	LS		
20		Single Post Pyramid Cantilever Shade Structure, Provided & Installed	1	EA		

BID GUARANTEE

The undersigned Bidder agrees to execute the Contract for the above amount and to furnish surety as specified within 10 days after notice of award, if offered within 120 calendar days after receipt of bids, and upon failure to do so agrees to forfeit the attached cash, cashier's check, certified check, U. S. money order, or bid bond, as liquidated damages for such failure, in the amount of:

_____ Dollars (\$ _____)
the stated amount constituting five percent (5%) of the Base Bid amount above.

If the Project costs are greater than \$300,000, NCGS 143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except (i) if the listed subcontractor's bid is later determined by the contractor to be non-responsive or the listed subcontractor refuses to enter into a contract for complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.

List the following subcontractors you are using on this project:

Electrical	_____	License # _____
Mechanical, if applicable	_____	License # _____
Plumbing, if applicable	_____	License # _____
Fire Protection, if applicable	_____	License # _____

BID SUPPLEMENTS

Attached to this Bid Form and incorporated herein are the following documents, completed in full by the undersigned:

Bid Bond

PLEASE NOTE - FAILURE TO INCLUDE ALL BID SUPPLEMENTS MAY RESULT REJECTION OF THIS BID.

CONTRACTOR'S LICENSE

The undersigned further states that he is a duly licensed Contractor, for the type of work proposed, in the State of North Carolina, and that all fees, permits, etc., pursuant to the submission of this proposal have been paid in full.

LICENSE # _____.

CONFIDENTIALITY REQUIREMENTS

By signing this bid form, I acknowledge that I have read, understand and shall comply with the confidentiality requirements as stated in the Instruction to Bidders.

Contractor's Signature

Subscribed and sworn before me this ____ day of _____, 2026.

Signature of Notary _____

of _____ County, State of _____

My Commission Expires: _____

B. EXECUTION OF BID**NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION**

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the Bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the Bidder has not been convicted of violating North Carolina General Statute 133-24 within the last three years, and that the Bidder intends to do the work with its own bona fide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

NC General Statute 133-32 prohibits the offer to, or acceptance by, any City Employee of any gift from anyone with a contract with the City or State, or from any person seeking to do business with the City of Hickory. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

The undersigned, having carefully examined the site and familiarized himself with the existing conditions on the Project area affecting the cost of work and hereby proposes to furnish all supervision, labor, equipment, materials and services required to construct and complete the Project in accordance with the Bid Documents at and for the total Bid amount.

The undersigned attests that he/she has the legal authority to execute this Bid on behalf of the corporation.

The undersigned acknowledges receipt of the following addenda (initial next to each addendum):

1: ____ # 2: ____ # 3: ____ # 4: ____ # 5: ____ # 6: ____ # 7: ____ # 8: ____ # 9: ____

Type of Bidder: ☐ Sole Proprietor ☐ Partnership ☐ Corporation ☐ Limited Liability Company
☐ Joint Venture

(if joint venture, complete this "Execution of Bid" sheet for each joint venture company and identify the "Name of Joint Venture" on each sheet)

Name of Joint Venture: _____

Company Name: _____

Mailing Address: _____

City/State/Zip: _____

Phone Number: _____

Print Name: _____

Signature: _____

IV.CONTRACT REQUIREMENTS AND FORMS

A. CONTRACT

This Contract is made and entered into by and between the City of Hickory (the “Owner”), a municipal corporation, having a mailing address of P.O. Box 398, Hickory, NC, and [name of company] (the “Contractor”), [indicate type of legal entity and mailing address], and is effective as of the last date herein below signed (the “Effective Date”). The identified parties are at times referred to herein collectively as “Parties” and individually as a “Party.”

1. **Background and Project Manual.** The Owner has accepted the bid of the Contractor for construction of “MIRACLE OF HICKORY PARK MODIFICATION” (the “Project”) advertised by the Owner on [insert date] in the bid management system under “MIRACLE OF HICKORY PARK MODIFICATION”. Project No. 27-006 (hereinafter, “the Project Manual” including Addenda).

2. **Definitions.**

a. “Contract Documents” and “Contract” shall mean executed agreement between the Owner and the successful bidder, covering the performance of and compensation for the Work. The term Contract is all inclusive with reference to all written agreements affecting a contractual relationship and all documents referred to therein. The Contract shall include, but not be limited to the Invitation to Bid, Instructions to Bidders, Bid Form and Supplements, Contract Requirements and Forms, required certificates and affidavits, bonds, addenda, technical specifications and plans. The Contract shall constitute one instrument.

b. “Change Order” shall mean a written order to the Contractor covering changes in the Plans, Specifications, Contract Item quantities, or Work and establishing the basis of payment and Contract Time adjustment, if any, for the Work affected by such changes.

c. “Final Completion” shall mean the completion of all Work required by, and in strict compliance with, the Contract, including start up, testing, obtaining regulatory approvals from all applicable authorities, and all preparations necessary to operate and maintain the Project.

d. “Substantial Completion” shall mean that stage of completion of the Project, including testing, approval by any applicable regulatory authority, and receipt of all the certificates of occupancy and other permits, approvals, licenses, and other documents from all governmental authorities that are necessary for the beneficial occupancy and use of the portion to be occupied or utilized such that the Work and the Project are functionally and legally usable by the Owner for the purpose for which they are intended.

e. “Surety” shall refer to the corporation, partnership, or individual, other than the Contractor, executing a Bid Payment, Performance or Guaranty Bonds that are furnished to the Owner by the Contractor. If no payment or performance bonds are required, any sentence referencing the “Surety” in this contract shall not apply.

f. “Work” shall mean the furnishing of all labor, materials, tools, equipment, and incidentals necessary to the Contractor’s performance of all duties and obligations imposed by the Contract.

3. Description of Work; Obligations of Contractor.

a. Unless the context requires otherwise, if this Contract states that a task is to be performed or that a duty is owed, it shall be presumed that the task or duty is the obligation of the Contractor.

b. The Contractor shall obtain from the Owner at its expense at least one copy each of the Plans and Specifications released for construction of the Project. The Contractor shall have available on the Project site at all times one copy of the Plans and Specifications. Additional copies of Plans and Specifications may be obtained by the Contractor for the cost of reproduction. The Contractor shall give constant attention to the Work to facilitate the progress thereof and shall cooperate with the Engineer and the Engineer's inspectors and with other contractors in every way possible. The Contractor shall have a competent superintendent on overseeing the Project at all times who is fully authorized as the Contractor's agent on the Project. The superintendent shall be capable of reading and thoroughly understanding the Plans and Specifications and shall receive and fulfill instructions from the Engineer or the Engineer's authorized representative.

c. The Contractor, at its own cost and expense and with skill and diligence, shall perform all the Work necessary for the Project, including furnishing all labor, tools, materials, and equipment, and do all things necessary for the proper construction and completion of the Work pursuant to the Contract terms and consistent with the plans, specifications, drawings, schedules, and other documents attached to this Contract or incorporated by reference.

d. All Work shall be performed in accordance with, and materials shall meet the requirements of, the following documents, which are incorporated herein by reference: (i) Project Manual; (ii) Contract Documents; (iii) General Conditions; and (iv) Plans and Specifications.

e. The Contractor shall further perform the Work in accordance with the directions (not inconsistent therewith) given from time to time by the Owner individual assigned to administer this Contract, referred to as the Project Manager or the Engineer, or other person as the City Manager may designate. For purposes of this Contract, the term "Engineer" shall refer to the City Manager of the City of Hickory or his or her designee acting directly or through a duly authorized representative, including the Project Manager or a designated engineering consultant, acting within the scope of particular assigned or contracted duties and authority.

4. Contract Times; Liquidated Damages.

a. Time is of the Essence. All time limits for milestones, if any, final completion, and readiness for final payment as stated in the Contract are of the essence of the contract.

b. Contract Time. The Work shall be substantially completed within 180 days ("Contract Time") after the date when the Contract Time commences to run from the Notice to Proceed (Substantial Completion), and finally completed and ready for final payment 210 days after the date when the Contract Times commence to run from the Notice to Proceed (Final Completion). The Contract Time may be extended only by written Change Order.

c. Liquidated Damages. The Contractor and the Owner recognize that time is of the essence of this Contract and that the Owner will suffer financial loss if the Work is not completed within

the times specified above, plus any extensions thereof allowed. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by the Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, the Owner and the Contractor agree that as liquidated damages for the delay (but not as a penalty), the Contractor shall pay the Owner \$500 for each day that expires after the time specified above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if the Contractor shall neglect, refuse, or fail to complete the remaining Work within 30 days after Substantial Completion or any proper extension thereof granted by the Owner, the Contractor shall pay the Owner \$750 for each day that expires after the time specified above for final completion and readiness for final payment until the Work is completed and ready for final payment.

d. Waiver of Liquidated Damages. If liquidated damages are assessable against the Contractor, the Owner may, in its discretion, waive the imposition of some or all of the liquidated damages against the Contractor. That waiver shall be valid only if done by a writing signed by the City Manager or a Deputy City Manager, and the waiver must refer specifically to “liquidated damages.” That waiver shall not constitute an extension of the Contract Time.

5. Delay Events and Extension of Contract Times.

a. Where the Contractor is prevented from completing the Work within the Contract Times due to delay beyond the control of the Contractor (hereinafter “Delay Event”), the Contract Times may be extended in an amount equal to the time lost due to such Delay Event after approval of the Owner for such time extension. Delay Events shall include, but not be limited to, acts or neglect by the Owner, acts or neglect of utility owners or other contractors performing other work at the Project site, fires, floods, epidemics, abnormal weather conditions, or acts of God.

b. The Owner shall extend the Contract Times equal to the time lost due to the Delay Event conditioned upon Contractor’s compliance with the following:

- (i) Contractor shall notify Owner of the Delay Event pursuant to Sec. 18 (Notice) within fifteen (15) calendar days after the end of the Delay Event (“Delay Event Notice”).
- (ii) The Delay Event Notice shall provide sufficient information and detail necessary for the Owner to determine (A) the nature of the Delay Event, (B) the Contractor’s critical path schedule that was impacted by the Delay Event and the amount of time the critical path was impacted due to the Delay Event, and (C) that the Contractor was unable to control or otherwise mitigate the impacts of the Delay Events to allow the Project to remain on schedule to be completed within the original Contract Times.

6. Contractor’s Billings to Owner; Compensation.

a. The Contractor shall submit applications for payment to the Owner monthly for the amounts to be paid pursuant to this contract. Each application shall document, to the reasonable satisfaction of the Owner, such information as may be reasonably requested by the Owner, including a record of the percent completion of the Work according to an appropriate schedule of values or other measure of work completion. The Owner will make progress payments based on Work progress estimates

based on the schedule of values (and in the case of Unit Price Work based on the number of units completed). Progress payments will be made within thirty (30) calendar days after receipt of a complete and accurate payment request, subject to deductions or retainage specified in Section 10. Progress payments will be approximate only and will be subject to correction in the final estimate and payment.

b. The Owner shall pay the Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amount determined provided below:

- (i) For all Work other than Unit Price Work, a lump sum of \$[insert amount].
- (ii) For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of that item as indicated in this below:

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	EXTENDED PRICE
1					
2					
3					
4					
5					
7					
8					
9					
10					
ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	EXTENDED PRICE
TOTAL CONTRACT PRICE					

The estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by the Engineer pursuant to the contract terms. The Owner shall not be obligated to pay the Contractor any payments, fees, expenses, or compensation other than those authorized by this section or by Section 20 (Termination for Convenience ("TFC")). The total dollar amount to be paid under this Contract by the Owner to the Contractor shall not exceed the total lump sum and/or estimated extended quantities price of \$[insert amount] ("Contract Price").

7. Payment and Performance Bonds; Insurance.

- a. Payment and Performance Bonds. Will be required under Chapter 44A of the

North Carolina General Statutes (“NCGS”), or otherwise by the Owner, the Contractor shall deliver to the Owner a payment and performance bond in a form acceptable to the Owner and in the amount of the total Contract Price.

b. Insurance. The Contractor agrees to maintain on a primary basis, at its sole expense, and at all times during the life of this Contract the following applicable coverages and limits. The requirements contained herein, as well as the Owner’s review or acceptance of insurance maintained by the Contractor, is not intended to, and shall not in any manner, limit or qualify the liabilities or obligations assumed by the Contractor under this Contract.

[City staff –to be filled in. Email the draft contract to Risk Management at mfriar@hickorync.gov so Risk can provide the insurance requirements for your specific contract.]

- (i) Commercial General Liability. The Contractor agrees to maintain commercial general liability with combined single limit of no less than \$1,000,000 each occurrence and \$2,000,000 aggregate. Coverage shall not contain any endorsement excluding or limiting Product/Completed Operations, Contractual Liability, Cross Liability, or Personal and Advertising Injury Liability. The Contractor agrees to endorse the Owner as an “Additional Insured” on the Commercial General Liability policy. The Additional Insured shall read “City of Hickory as its interest may appear.”
- (ii) Automobile Liability. The Contractor agrees to maintain automobile liability with limits of no less than \$1,000,000 Combined Single Limit. Coverage shall include liability for Owned, Non-Owned, and Hired automobiles. In the event the Contractor does not own automobiles, the Contractor agrees to maintain coverage for Hired and Non-Owned Auto Liability, which may be satisfied by way of endorsement to the Commercial General Liability policy or by separate Auto Liability policy. Automobile coverage is necessary only if vehicles are used in the provision of services under this contract or are brought on an Owner site.
- (iii) Umbrella or Excess Liability. The Contractor may satisfy the minimum liability limits required above under an Umbrella or Excess Liability policy. There is no minimum Per Occurrence limit of liability under the Umbrella or Excess Liability. However, the Annual Aggregate limits shall not be less than the highest “Each Occurrence” limit for required policies. The Contractor agrees to endorse the Owner as an “Additional Insured” on the Umbrella or Excess Liability unless the certificate of insurance states the Umbrella or Excess Liability provides coverage on a “Follow-Form” basis. The Additional Insured shall read “City of Hickory as its interest may appear.”
- (iv) Builder’s Risk. The Contractor shall procure and maintain Builder’s Risk Insurance coverage at an “all-risk” or equivalent policy form in the amount of the Contract Price, plus the value of any subsequent modifications to the Contract Price and costs of materials supplied or installed by others, comprising the total value for the Project on a replacement cost basis

without optional deductibles. Such insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until Final Payment has been made under Section 11 of this contract. This insurance shall include interest of the Owner, Contractor, and subcontractors in the Project. The Contractor agrees to endorse the Owner as an “Additional Insured” on the Builder’s risk policy. The Additional Insured shall read “City of Hickory as its interest may appear.”

- (v) Workers’ Compensation & Employers Liability. The Contractor agrees to maintain Worker’s Compensation Insurance in accordance with Chapter 97 of the North Carolina General Statutes and with Employer Liability limits of no less than \$1,000,000 for each accident, each employee, and policy limit. This policy must include a waiver of subrogation.
- (vi) Waiver of Subrogation. The Contractor and each of its subcontractors shall and do waive all rights of subrogation against the Owner.
- (vii) Certificate of Insurance. The Contractor agrees to provide the Owner a certificate of insurance evidencing that all coverage, limits, and endorsements required herein are maintained and in full force and effect, and certificates of insurance shall provide a minimum thirty (30) day endeavor to notify, when available, by the Contractor’s insurer. If the Contractor receives a non-renewal or cancellation notice from an insurance carrier affording coverage required herein or receives notice that coverage no longer complies with the insurance requirements herein, the Contractor agrees to notify the Owner within five (5) Business Days with a copy of the non-renewal or the cancellation notice or with written specifics as to which coverage is no longer in compliance. The Certificate Holder address should appear as follows:

City of Hickory
Attn: City Manager’s Office
P.O. Box 398
Hickory, NC 28603

All primary insurance carriers must be authorized to do business in North Carolina. As used in this Contract, “Business Day” is defined as any day other than Saturdays, Sundays, and any legal holiday recognized by the Owner.

8. **Exhibits.** The following exhibits are made a part of this Contract: [If none, write “None.”]

EXHIBIT	DESCRIPTION
Exhibit A	Documents not incorporated by reference that need to be part of the Contract
Exhibit B	Payment and Performance Bonds, containing [insert number of pages] page(s).

9. **Notice Addresses.** For purposes of Section 18 (Notice) of the General Conditions, and subject to change pursuant to subsection 18(d), the addresses for these notices are as follows:

To the Owner:

[Insert name and department]

City of Hickory

P.O. Box 398

Hickory, NC 28603

Email:

To the Contractor:

[Insert name and address]

Email:

10. **Progress payments. Retainage.**

a. The Owner shall make progress payments on account of the Contract Price on the basis of the Contractor's applications for payment consistent with Section 6 (Contractor's Billing to Owner; Compensation). All such payments will be measured by Work progress estimates based on the schedule of values (and in the case of Unit Price Work based on the number of units completed). Progress payments will be less the aggregate of payments previously made, retainage as specified below, and such amount as the Engineer may determine is not appropriate based on unsatisfactory job progress, defective or nonconforming construction not remedied, disputed Work, unjustified withholding of payments or nonpayment of subcontractors by the Contractor, third-party claims filed against the Owner or reasonable evidence that a third-party claim will be filed, or amounts the Owner may withhold as liquidated damages.

b. Five percent (5%) of each progress payment will be retained by the Owner, subject to the terms of NCGS 143-134.1 (the "Retainage"). The Retainage is intended to secure performance of Contractor's obligations under this contract and to protect the Owner against potential claims, defects, or non-conforming work. The Owner shall hold the Retainage until Final Completion and acceptance of the Project. The Retainage shall not be subject to interest accrual for the benefit of the Contractor. Upon Substantial Completion of the Project, the Owner may, at its sole discretion, reduce the Retainage percentage for subsequent invoices. The Retainage will be released to Contractor within thirty (30) days after Final Completion and acceptance of the Project by the Owner, provided that: (A) Contractor has fully performed all obligations under this contract; (B) Contractor has remedied all defective or non-conforming work; (C) Contractor has settled all claims or provided satisfactory evidence that no claims will be filed; (D) Contractor has provided all required final documentation, including but not limited to warranties, as-built drawings, and operation manuals; (E) Contractor has provided a final waiver and release of liens.

c. Notwithstanding any of the retainage provisions described herein, there shall be no retainage on periodic or final payments for contracts having a total project cost less than \$100,000.00, and, in addition to the retainage amounts allowed to be held by the Owner, the Owner shall also retain all rights allowed under this Contract to withhold payment to the Contractor for unsatisfactory job progress, defective or nonconforming construction not remedied, disputed Work, unjustified withholding of payments or nonpayment of subcontractors by the Contractor, third-party claims filed against the Owner or reasonable evidence that a third-party claim will be filed, and withholding as liquidated damages.

d. Within sixty (60) days of receipt by the Owner of (A) an Application for Payment and (B) written consent of the Surety, and after the Owner has either (C) received a certificate of Substantial Completion or (D) received beneficial occupancy or use of the Project (if applicable), the Owner shall pay an amount sufficient to increase total payment to the Contractor to the Contract Price, less such amounts as the Engineer shall determine is not appropriate based on unsatisfactory job progress, defective or nonconforming construction not remedied, disputed Work, unjustified withholding of payments or nonpayment of subcontractors by the Contractor, third-party claims filed against the Owner or reasonable evidence that a third-party claim will be filed, and withholding as liquidated damages, including up to two hundred fifty percent (250%) of the Engineer's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

e. If any mechanic's or materialman's lien, or any notice or claim of such lien, is filed against the Project for any labor, materials, supplies, or equipment claimed to have been furnished to or incorporated into the Work, or for any other alleged contribution thereto, the Owner shall have the right to retain from payments otherwise due the Contractor, in addition to all other amounts properly withheld under this Article or under other provisions of the Contract, an amount equal to such lien or liens claimed. The Contractor warrants that: (i) all materials are free and clear of all liens, claims, security interests, or encumbrances; and (ii) no materials have been acquired by the Contractor, or by any other person performing Work at the site or furnishing materials for the Work under this Contract, that are subject to an agreement under which an interest in, or encumbrance on, the materials or equipment is retained by the seller or otherwise imposed.

f. In accordance with NCGS § 22C, the Contractor is required to pay subcontractors for satisfactory performance of their contracts within seven (7) calendar days after the Owner has paid the Contractor for such Work. Additionally, the Contractor shall pay the undisputed portions of subcontractors' invoices no later than ninety (90) calendar days of the date of subcontractor's invoice, independent of any payment by the Owner to the Contractor. If the Contractor withholds any retainage pending final completion of any subcontractor's Work, the Contractor is required to pay the retainage so withheld within seven (7) calendar days after such subcontractor completes his Work satisfactorily, regardless of any payment of retainage by the Owner to the Contractor. The Contractor's failure to pay subcontractors as provided herein shall be a material breach for which the Owner may cancel the Contract.

11. Inspections; Final Payment; Warranty.

a. Inspections. The Owner shall have the right to sample and test the Work. When the Owner performs sampling and tests of the Work and if the tests show a failure to meet the requirements of the Contract Documents, the expense of retesting, after reworking or substitution by the Contractor will be at the expense of the Contractor and such costs will be deducted from the payments otherwise due to the Contractor.

b. Final Inspection. Upon final completion of the Work and after the Contractor has satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the contract documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents, submission of final application for payment by the Contractor to the Engineer, the Engineer

shall inspect the Work for conformance with the contract documents for final acceptance.

c. Lien Waivers and Releases. Prior to issuing final payment, the Contractor will furnish to the Owner certification in the form of the “Contractor’s Affidavit – Release and Waiver of Claims” (form provided by Owner) that all subcontractors and vendors associated with this Contract have been paid; no liens and/or lawsuits have been placed against the Contractor for this Work; and the total dollar amount has been paid to all subcontractors, suppliers, and others associated with this Project.

d. Final Payment and Acceptance. The Owner shall pay the remainder of the Contract Price as recommended by the Engineer subject to Section 10(c) after the Contractor has delivered to the Engineer (i) all documentation called for in the contract documents, including evidence of insurance; (ii) consent of the Surety, if any, to final payment; (iii) a list of all claims against the Owner that the Contractor believes are unsettled; and (iv) complete and legally effective releases or waivers (satisfactory to the Owner) of all lien rights arising out of or liens filed in connection with the Work.

e. Interest. All monies not paid when due shall bear interest at the rate of four percent (4%) per annum.

f. Warranty.

(i) The Contractor shall warrant that the Work is in substantial conformance with the contract documents. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the contract documents) or by any specific provision of the contract documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for the Contractor’s use by the Owner or permitted by applicable laws and regulations is found to be defective, the Contractor shall promptly (but in any event, commencing within thirty (30) days after receipt of said instructions and proceeding promptly to completion), without cost to the Owner and in accordance with the Owner’s written instructions do the following:

1. repair such defective land or areas;
2. correct such defective Work; or
3. if the defective Work has been rejected by the Owner, remove it from the Project and replace it with Work that is not defective; and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or other land or areas resulting therefrom.

g. Limitation to Contractor’s Warranty. The Contractor’s warranty and guarantee hereunder excludes defects or damage caused by (A) abuse, modification, or improper maintenance or operation by persons other than the Contractor, its subcontractors, or any other individual or entity for whom the Contractor is responsible; or (B) normal wear and tear under normal usage.

12. Change Orders. The Owner may, at any time, without invalidating the Contract, order changes in the Work within the general scope of the contract consisting of additions, deletions, or other

revisions. Such changes shall only be authorized by a written Change Order (form provided by Owner) signed by the Owner and the Contractor.

13. Contractor's Representations.

a. In order to induce the Owner to enter into this Contract, the Contractor makes the following representations:

- (i) The Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
- (ii) The Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- (iii) The Contractor is familiar with and is satisfied as to all federal, state, and local laws and regulations that may affect cost, progress, and performance of the Work.
- (iv) The Contractor has carefully studied all of the following:
 - 1. Reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Project site (except underground facilities) if identified by the Owner; and
 - 2. Reports and drawings of any hazardous environmental condition, if any, at the Project site if identified by the Owner.
- (v) The Contractor has obtained and carefully studied (or assumes responsibility for doing so) all additional and supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground facilities) at or contiguous to the Project site that may affect cost, progress, or performance of the Work or that relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by the Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the bidding documents, and safety precautions and programs incident thereto.
- (vi) The Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the contract documents.
- (vii) The Contractor is aware of the general nature of work to be performed by

the Owner and others at the Project site that relates to the Work as indicated in the contract documents.

- (viii) The Contractor has correlated the information known to the Contractor, information and observations obtained from visits to the Project site, reports and drawings identified in the contract documents, and all additional examinations, investigations, explorations, tests, studies, and data with the contract documents.
- (ix) The Contractor has given the Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that the Contractor has discovered in the contract documents, and the written resolution thereof by the Engineer is acceptable to the Contractor.
- (x) The contract documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- (xi) The Contractor affirmatively acknowledges and agrees that (a) the Contract Times provided for in the contract documents to complete the Work are reasonable and (b) the compensation provided for the Work in the contract documents is reasonable.

14. **Federal Law Provisions.** Notwithstanding any provision of this Contract to the contrary, the Contractor shall comply with the federal clauses for contracts involving federal financial assistance, if federal financial assistance funds are used for the Project.

15. **Dispute Resolution.** Any party allowed to use the dispute resolution process adopted by the State Building Commission pursuant to NCGS §143-135.26(11) (the “DR process”) shall participate in mediation pursuant to the DR process as a precondition to initiating litigation concerning the dispute. The amount of \$15,000 or more must be at issue before a party may require other parties to participate in the DR process. The costs of the DR process shall be divided between the parties to the dispute with one-third of the costs to be paid by the Owner, if the Owner is a party to the dispute. If only the Owner and one other party are parties to a dispute, the two parties shall divide the costs of the DR process equally.

16. **Complete Work without Extra Cost.** Except to the extent otherwise specifically stated in this contract, the Contractor shall obtain and provide, without additional cost to the Owner, all labor, materials, equipment, transportation, facilities, services, permits, and licenses necessary to perform the Work.

17. **Performance of Work by Owner.** If this contract requires the Work be completed according to a schedule, and the Contractor fails to perform the Work in accordance with the required schedule, the Owner may, in its discretion, in order to bring the project closer to the schedule, perform or cause to be performed some or all of the Work, and doing so shall not waive any of the Owner’s rights and remedies. Before doing so, the Owner shall give the Contractor notice of its intention. The Contractor shall reimburse the Owner for additional costs incurred by the Owner in exercising its right to perform or cause to be performed some or all of the Work pursuant to this section.

18. Prompt Payment to Subcontractors.

a. Within seven (7) days of receipt by the Contractor of each payment from the Owner under this contract, the Contractor shall pay all subcontractors (which term includes subconsultants and suppliers) based on work completed or service provided under the subcontract. Should any payment to the subcontractor be delayed by more than seven (7) days after receipt of payment by the Contractor from the Owner under this Contract, the Contractor shall pay the subcontractor interest, beginning on the eighth (8th) day, at the rate of one percent (1%) per month or fraction thereof on such unpaid balance as may be due. By appropriate litigation, each subcontractor shall have the right to enforce this subsection (a) directly against the Contractor but not against the Owner.

b. If the individual assigned to administer this Contract for the Owner (in this section he or she will be referred to as the “Project Manager”) determines that it is appropriate to enforce subsection (a) in this manner, the Owner may withhold from progress or final payments to the Contractor the sums estimated by the Project Manager to be:

- (i) the amount of interest due to the subcontractor under subsection (a); and/or
- (ii) the amounts past-due under subsection (a) to the subcontractor but not exceeding five percent (5%) of the payment(s) due from the Owner to the Contractor.

This subsection (b) does not limit any other rights to withhold payments that the Owner may have.

c. Nothing in this section shall prevent the Contractor at the time of invoicing, application, and certification to the Owner from withholding invoicing, application, and certification to the Owner for payment to the subcontractor for unsatisfactory job progress; defective construction not remedied; disputed work; third party claims filed or reasonable evidence that claim will be filed; failure of subcontractor to make timely payments for labor, equipment, and materials; damage to the Contractor or another subcontractor; reasonable evidence that subcontract cannot be completed for the unpaid balance of the subcontract sum; or a reasonable amount for retainage not to exceed the initial percentage retained by the Owner.

d. The Project Manager may require, as a prerequisite to making progress or final payments, that the Contractor provide statements from any subcontractors designated by the Project Manager regarding the status of their accounts with the Contractor. The statements shall be in such format as the Project Manager reasonably requires, including notarization if so specified.

19. Notice.

a. In General. This subsection (a) pertains to all notices related to or asserting default, breach of contract, claim for damages, suspension or termination of performance, suspension or termination of contract, and requests for extension of Contract Times.

b. Means of Delivery of Notice. (i) Common Carrier. All such notices shall be in writing and sent by common carrier or personal delivery. Those sent by common carrier shall include instructions to obtain the recipient's signature and/or a signature at the recipient's address. Common carrier means UPS, FedEx, a designated delivery service authorized pursuant to 26 United States Code 7502(f)(2), or United States Postal Service. (ii) Notice given by Personal Delivery. If the sender causes the notice to be hand delivered to a natural person 18 years or older at the address of the Contractor indicated under Section 9 (Notice Addresses) above, notice is deemed given. (iii) Common Carrier Leaves Notice. If the sender obtains a signature through a common carrier pursuant to subsection (i), notice is deemed given. If, however, the common carrier does not obtain such a signature between 8:30 AM – 4:30 PM Monday- Friday on a day that is not a Holiday but leaves the notice in a place that it deems safe without obtaining a signature, this process constitutes delivery of the notice provided that the sender also sends the notice by email or fax. Notice is deemed given on the later of (x) the leaving of the notice by the common carrier and (y) the email or fax. A notice is deemed emailed on the date that the sender attempts to send it. A notice is deemed faxed at the earlier of when successfully received or when faxing is unsuccessfully attempted three times at least ten minutes apart. (iv) Requested Additional Method. Regardless of the method of giving notice, the sender is requested but not required to also send it by fax or email.

c. When Undeliverable Notice Is Deemed Sent by Common Carrier. If a notice sent by common carrier is undeliverable because the address or other information provided to the sender by the other party (the intended recipient) is incorrect, incomplete, or out of date, or for any other reason; and the sender also sends the notice by fax or email, notice is deemed given on the later of (x) the sender's placing the notice in the custody of the common carrier and (y) the fax or email. A notice is deemed emailed on the date that the sender attempts to send it. A notice is deemed faxed at the earlier of when successfully received or when faxing is unsuccessfully attempted three times at least ten minutes apart.

d. Change of Address. A change of address, fax number, email address, telephone number, or person to receive notice shall be made by notice given to the other party.

20. Indemnification.

a. Standard Indemnification Provision. This section shall be applied to the maximum extent allowed by law, but it shall be construed and limited as necessary to comply with NCGS §22B-1. The Contractor shall defend, indemnify, and hold harmless Indemnitees from and against all Charges that arise in any manner from, in connection with, or out of this contract as a result of acts or omissions of the Contractor or its Derivative Parties. In performing its duties under this subsection, the Contractor shall at its sole expense defend Indemnitees with legal counsel reasonably acceptable to the Owner. "Charges" means claims, judgments, costs, damages, losses, demands, liabilities, duties, obligations, fines, penalties, royalties, settlements, and expenses. Included without limitation within "Charges" are (1) interest and reasonable attorney's fees assessed as part of any such item, and (2) amounts for alleged violations of sedimentation pollution, erosion control, pollution, or other environmental laws, regulations, ordinances, rules, or orders -- including but not limited to any such alleged violation that arises out of the handling, transportation, deposit, or delivery of the items that are the subject of this contract. By appropriate litigation, each Indemnatee, severally, shall have the right to enforce this section (titled "Indemnification") directly against the Contractor, but not against the Owner.

b. Definitions. These definitions apply to this section only unless otherwise stated.

- (i) The words “Construction Agreement,” “Derivative Parties,” “Design Professional,” “Design Professional Agreement,” “Design Professional Services,” “Fault,” and “Subcontractor” as used in this section shall have the meanings defined by NCGS §22B- 1.
- (ii) “Contractor” – Each party to this Contract except the City of Hickory.
- (iii) “Indemnitees” means the Owner and its officers, officials, independent contractors, agents, and employees, excluding the Contractor.
- (iv) In this section, except as used in subsection (a), “Defend” means to pay for or furnish counsel at the expense of the Contractor to defend any of the Indemnitees against claims alleged or brought against any of the Indemnitees by a third party alleged or brought in any court or other tribunal, including forms of alternative dispute resolution required by law or contract, before the court or tribunal has reached a final determination of fault.

c. Insurance Contracts and Bonds. This section does not affect an insurance contract, workers’ compensation, or any other agreement issued by an insurer, and this section does not apply to lien or bond claims asserted under NCGS Chapter 44A.

d. Survival. This section shall remain in force despite termination of this contract (whether by expiration of the term or otherwise) and termination of the services of the Contractor under this contract.

e. Restrictions and Qualifications. If this Contract is a Construction Agreement or a Design Professional Agreement, the following restrictions and qualifications apply to the Standard Indemnification Provision of Section 19:

- (i) Restriction regarding Indemnitees’ Negligence. The Contractor shall not be required to indemnify or hold harmless Indemnitees against liability for damages arising out of bodily injury to persons or damage to property proximately caused by or resulting from the negligence, in whole or in part, of Indemnitees.
- (ii) Restriction regarding Fault in Construction Agreements and Design Professional Agreements. Nothing in this Contract requires the Contractor to indemnify or hold harmless Indemnitees or any other person or entity against losses, damages, or expenses unless the fault of the Contractor or its Derivative Parties is a proximate cause of the loss, damage, or expense indemnified.
- (iii) Restriction regarding Negligence of Design Professionals. Nothing in this Contract requires the Contractor, provided that it is a design professional, to defend Indemnitees or any other person or entity against liability or claims for damages, or expenses, including attorney’s fees, proximately caused or allegedly caused by the professional negligence, in whole or in part, of the Contractor, the Owner, or their Derivative Parties, whether the claim is alleged or brought in tort or contract.

- (iv) Liability When at Fault. The parties intend that nothing in this contract shall be construed to exclude from any indemnity or hold harmless provisions enforceable under subsection (e)(i) (Restriction regarding Indemnitees' Negligence) and subsection (e)(ii) (Restriction regarding Fault in Construction Agreements and Design Professional Agreements) any attorneys' fees, litigation or arbitration expenses, or court costs actually incurred by the Owner to defend against third party claims alleged in any court, tribunal, or alternative dispute resolution procedure required of the Owner by law or by contract, if the fault of the Contractor or its Derivative Parties is a proximate cause of the attorney's fees, litigation or arbitration expenses, or court costs to be indemnified. Every provision in this Contract that violates the parties' intent expressed in the preceding sentence shall be construed and revised to the extent that it is lawful in order to make the provision conform with such intent.
- (v) Other Provisions. Every provision in this Contract that violates this subsection (v) shall be construed and revised to the extent that it is lawful in order to make the provision conform with those subsections.

21. Termination for Convenience (TFC).

- a. Procedure. Without limiting any party's right to terminate for breach, the parties agree that the Owner may, without cause, and in its discretion, terminate this contract for convenience by giving the Contractor written notice that refers to this section. TFC shall be effective at the time indicated in the notice.
- b. Obligations. Upon TFC, all obligations that are still executory on both sides are discharged except that any right based on prior breach or performance survives and the indemnification provisions shall remain in force. At the time of TFC or as soon afterwards as is practical, the Contractor shall give the Owner all Work, including partly completed Work. In case of TFC, the Contractor shall follow the Owner's instructions as to which subcontracts to terminate.
- c. Payment. The Owner shall pay the Contractor an equitable amount for the costs and charges that accrue because of the Owner's decisions with respect to the subcontracts, but that amount will exclude profit for the Contractor. Within 30 days of the Contractor's receipt of notice of TFC, the Owner shall pay the Contractor one hundred dollars (\$100) as a TFC fee. The Owner shall pay the Contractor for all Work performed up to the termination date indicated in the TFC notice, except to the extent Work has been paid for previously. Work shall be paid for in accordance with the method (unit prices, hourly fees, etc.) to be used for payment had the Work been completed, except to the extent it would be inequitable to either party. If Work was to be paid for on a lump-sum basis, the Owner shall pay the part of the lump sum that reflects the percentage of completion attained for that Work. The Contractor shall not be entitled to any payment because of TFC except as stated in this section, whether on the basis of overhead, profit, damages, other economic loss, or otherwise.

22. Taxes and Licenses. North Carolina sales and/or use taxes are applicable to purchases of building materials and other tangible personal property by contractors for use in performing county contracts. Use tax is also due on construction equipment brought into North Carolina for use in the performance of city contracts (North Carolina Revenue Laws, N.C.G.S. 105- 164.4 and N.C.G.S. 105-164.6).

Contractors are liable for payment of applicable franchise, corporate income, license and withholding taxes (North Carolina Revenue Laws, N.C.G.S. 105-122, 105-123, 105-134 and 105-163.2).

23. **E-Verify Requirements.** (a) If this contract is awarded pursuant to NCGS §143-129 – (i) the Contractor represents and covenants that the Contractor and its subcontractors comply with the requirements of Article 2 of Chapter 64 of the NCGS; (ii) the words “contractor,” “contractor’s subcontractors,” and “comply” as used in this subsection (a) shall have the meanings intended by NCGS §143-129(j); and (iii) the Owner is relying on this subsection (a) in entering into this contract. (b) If this contract is subject to NCGS §143-133.3, the Contractor and its subcontractors shall comply with the requirements of Article 2 of Chapter 64 of the NCGS.

24. **NC Prohibitions on Contracts with Companies that Invest in Iran or Boycott Israel.** Contractor warrants and certifies that it is not identified on the Final Divestment Lists created by the NC State Treasurer pursuant to N.C.G.S. 147 Articles 6e or 6g. Contractor further warrants and certifies it will not take any action during the term of this contract that would provide a basis for it to be placed upon the Final Divestment Lists nor will it utilize on this contract any subcontractor that is identified on the Final Divestment Lists. In signing this contract, Contractor further agrees, as an independent obligation, separate and apart from this contract, to reimburse the Owner for any and all damages, costs and attorneys’ fees incurred by the Owner in connection with any claim that this contract or any part thereof is void due to Contractor appearing on the Final Divestment Lists.

25. **Choice of Law and Forum; Service of Process.**

a. This Contract shall be deemed made in Catawba County, North Carolina. This Contract shall be governed by and construed in accordance with the law of North Carolina and not the United Nations Convention on Contracts for the International Sale of Goods. The exclusive forum and venue for all actions arising out of this contract shall be the North Carolina General Court of Justice in Catawba County. Such actions shall neither be commenced in nor removed to federal court. The preceding two sentences do not apply to actions to enforce a judgment entered in actions heard pursuant to this subsection (a).

b. If the Contractor is a business entity (for instance, the Contractor is a corporation or limited liability company), this subsection (b) applies. “Agent Authorized to Accept Service of Process” (“Agent”) means every person now or hereafter appointed by the Contractor to be served or to accept service of process in any State of the United States. The Contractor hereby appoints as one of those Agents the person it designates to receive notice pursuant to Section 9 (Notice Addresses). If the Contractor fails to appoint an Agent or the Agent cannot be served using reasonable diligence, the Contractor appoints the Hickory City Clerk as its Agent. Without excluding any other method of service authorized by law, the Contractor agrees that every Agent is designated as its non-exclusive Agent. The Contractor shall instruct each Agent that when the Agent receives the process, summons, or complaint, the Agent shall promptly send it to the Contractor using a means for giving notice under this Contract, provided that when the City Clerk is the Agent, the Owner shall issue such instructions. This subsection (b) does not apply while the Contractor maintains a registered agent in North Carolina by filing with the office of the North Carolina Secretary of State and that registered agent can be found with due diligence at the registered office.

26. **Waiver.** No action or failure to act by the Owner shall constitute a waiver of any of its rights or remedies that arise out of this Contract, nor shall such action or failure to act constitute approval

of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

27. **Performance of Government Functions.** Nothing contained in this Contract shall be deemed or construed so as to in any way estop, limit, or impair the Owner from exercising or performing any regulatory, policing, legislative, governmental, or other powers or functions.

28. **Severability.** If any provision of this Contract shall be unenforceable, the remainder of this contract shall be enforceable to the extent permitted by law.

29. **Counterparts.** This Contract may be executed in counterparts, each of which shall be deemed an original, but all of which together shall be deemed to be one and the same agreement. A signed copy of this Contract delivered by facsimile, email, or other means of electronic transmission shall be deemed to have the same legal effect as delivery of an original signed copy of this Contract.

30. **Pre-Audit Requirement.** This Contract has not been fully executed and is not effective until the Pre-audit Certificate (if required by N.C.G.S § 159-28) has been affixed and signed by the Owner's finance officer or deputy finance officer.

31. **Governmental Immunity.** Notwithstanding any other term or provision to the contrary, nothing in this Contract shall be interpreted as waiving any claim or defense based on the principle of sovereign or governmental immunity or other State or federal constitutional or statutory provision or principle that otherwise would be available to the Owner under applicable law.

32. **Assignment. Successors and Assigns.** Without the Owner's written consent, the Contractor shall not assign (which includes to delegate) any of its rights (including the right to payment) or duties that arise out of this contract. The City Manager may consent to an assignment without action by the City Council. Unless the Owner otherwise agrees in writing, the Contractor and all assignees shall be subject to all of the Owner's defenses and shall be liable for all of the Contractor's duties that arise out of this contract and all of the Owner's claims that arise out of this contract. Without granting the Contractor the right to assign, it is agreed that the duties of the Contractor that arise out of this contract shall be binding upon it and its heirs, personal representatives, successors, and assigns.

33. **Compliance with Law.** In performing all of the Work, the Contractor shall comply with all applicable law.

34. **Non-Discrimination.** THE OWNER OPPOSES DISCRIMINATION ON THE BASIS OF AGE, MENTAL OR PHYSICAL DISABILITY, SEX, RELIGION, CREED, RACE, COLOR, SEXUAL ORIENTATION, GENDER IDENTITY OR EXPRESSION, FAMILIAL OR MARITAL STATUS, ECONOMIC STATUS, VETERAN STATUS OR NATIONAL ORIGIN. The Contractor shall comply with all applicable provisions of the City of Hickory Code of Ordinances and state law and shall explicitly require the same of its subcontractors in their subcontracts.

35. **Limited Third-Party Rights Created.** This contract is intended for the benefit of the Owner and the Contractor and not for any other person, except to the extent otherwise expressly stated in this Contract.

36. **Principles of Interpretation.** (a) The singular includes the plural and the plural the singular. The pronouns "it" and "its" include the masculine and feminine. References to statutes or

regulations include all statutory or regulatory provisions consolidating, amending, or replacing the statute or regulation. References to contracts and agreements shall be deemed to include all amendments to them. The words “include”, “including”, etc. mean include, including, etc. without limitation. (b) References to a “Section” or “section” shall mean a section of this Contract. (c) “Duties” includes obligations. (d) The word “person” includes natural persons, firms, companies, associations, partnerships, trusts, corporations, governmental agencies and units, and other legal entities. (e) The word “shall” is mandatory. (f) The word “day” means calendar day. (g) The word “Holiday” means legal holiday observed by the Owner. (h) A definition in this Contract will not apply to the extent the context requires otherwise.

37. **Modifications; Entire Agreement.** A modification of this contract is not valid unless signed by both parties and otherwise in accordance with requirements of law. Further, a modification is not enforceable against the Owner unless it is signed by the City Manager, a deputy City Manager, or, in limited circumstances, a City department director. This Contract contains the entire agreement between the parties pertaining to the subject matter of this Contract. With respect to that subject matter, there are no promises, agreements, conditions, inducements, warranties, or understandings, written or oral, expressed or implied, between the parties, other than as set forth or referenced in this contract.

38. **Public Health Emergency Declarations.** This section shall take effect upon the declaration of a state of emergency made pursuant to applicable law, code, or ordinance by any federal, state, county, or city official, due to a public health emergency, such as an epidemic, pandemic, or endemic disease. The Contractor shall comply with the written procedures and policies adopted by the City department or office primarily responsible for administering this Contract. The Contractor shall ensure that all assigned temporary employees and subcontractors comply with the written procedures and policies while performing the Work on City property.

39. **City’s Manager’s Authority.** To the extent, if any, the Owner has the power to suspend or terminate this Contract or the Contractor’s services under this Contract, that power may be exercised by the City Manager or a deputy or assistant City Manager without City Council action.

[SIGNATURES APPEAR ON FOLLOWING PAGES]

IN WITNESS WHEREOF, and in acknowledgment that the parties hereto have read and understood each and every provision hereof, the parties have caused this Contract to be executed as of the Effective Date.

CONTRACTOR: _____

Address: _____

Federal Tax ID: _____

By: _____

Printed Name: _____

Title: _____

Date: _____

CITY OF HICKORY

By: _____

Printed Name: _____

Title: _____

Date: _____

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

CONTRACTOR SURETY COMPANY CONTACTS (IF APPLICABLE)

Bid Guaranty Bond No. _____

Surety Name: _____

Point of Contact: _____

Address: _____

Phone No.: _____

Performance Bond No.: _____

Surety Name: _____

Point of Contact: _____

Address: _____

Phone No.: _____

Payment Bond No.: _____

Surety Name: _____

Point of Contact: _____

Address: _____

Phone No.: _____

PLEASE ATTACH THE FOLLOWING TO THIS SHEET:

1. Bonds
2. A Certified Power of Attorney
3. Certificate of Insurance

B. GENERAL CONDITIONS

1. COOPERATION OF CONTRACTOR

The Contractor shall obtain from Owner at Owner's expense at least one copy each of the Plans and Specifications released for construction. It shall have available on the work at all times one copy each of the Plans and Specifications. Additional copies of Plans and Specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the Work to facilitate the progress thereof, and it shall cooperate with the Engineer and the Engineer's inspectors and with other contractors in every way possible. The Contractor shall have a competent superintendent on the Work at all times who is fully authorized as its agent on the Work. The superintendent shall be capable of reading and thoroughly understanding the Plans and Specifications and shall receive and fulfill instructions from the Engineer or the Engineer's authorized representative.

The Contractor shall comply with all applicable federal, state, or local laws or governmental regulations.

2. CONTRACTOR USE OF PREMISES

- A. Use of the Site: The Contractor shall confine his operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. The Contractor shall conform to site rules and regulations affecting the work while engaged in project construction.
- B. Open Passage: The Contractor shall keep existing drives, entrances, and air operations areas designated to remain open, clear and available to the Owner, his employees and the public at all times. The Contractor shall not use these areas for parking or storage of materials.
- C. Storage: The Contractor shall not unreasonably encumber the site with materials or equipment. The Contractor shall confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary, the Contractor shall obtain Owner's approval.
- D. Vehicle/Equipment Security: The Contractor shall lock automotive type vehicles, such as passenger cars and trucks, and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. The Contractor shall not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

3. WORK RESTRICTIONS

- A. Turf Restoration: All non-paved areas that are disturbed by the Contractor's work, including without limitation, staging area(s), haul roads, etc. shall be reseeded and restored to original condition by the Contractor. Except where otherwise specified, there will be no separate Contract Item for this work; it will be considered incidental to and included in the price bid.

- B. Security: Contractor shall provide security within his construction area and shall keep all unauthorized personnel out.
- C. Access Points: All construction traffic shall enter and exit the Project area only through the Project access point(s) identified by the Contractor and approved by the Owner. Contractor will be responsible for security of entrance gates under their use.
- D. Access and Haul Route: The Contractor shall be responsible for establishing haul routes suitable for supporting all necessary transportation and construction equipment for the duration of the Project. Any existing roads or other areas that are used as part of the haul route shall be restored to their original condition after completion of the Project. The Contractor will be responsible for all clean-up operations of debris that may be on the haul route and for watering and/or other dust preventive measures to preclude fugitive dust from affecting buildings, occupants, or airfield operations.
- E. Contacts During Non-Working Hours: For the duration of the Project, the Contractor shall designate a list of authorized individuals in a prioritized order, to be on 24 hour call, and these individuals shall be equipped with a cellular phone. These individuals shall be able to respond to any situation arising out of the performance of the work on this Project, particularly during nighttime hours, and shall respond and be on the Project site within one hour after the phone call.

4. REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK

All Work which does not conform to the requirements of the Contract Documents will be considered unacceptable, unless otherwise determined acceptable by the Owner.

Unacceptable Work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the Work, shall be removed immediately and replaced in an acceptable manner at the Contractor's expense.

Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans or as given, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the Contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply forthwith with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to cause unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to deduct the costs (incurred by the Owner) from any monies due or to become due the Contractor.

5. MAINTENANCE DURING CONSTRUCTION

The Contractor shall maintain the Work during construction and until the Work is accepted. This maintenance shall constitute continuous and effective work prosecuted day-by-day, with adequate equipment and forces so that the Work is maintained in satisfactory condition at all times.

In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various Contract Items, and the Contractor will not be paid an additional amount for such work.

6. TEST OF WORK

When as provided for in the contract documents, the Owner performs sampling and tests of the Work and if the tests show a failure to meet the requirements of the Contract Documents, the expense of retesting, after reworking or substitution by the Contractor will be at the expense of the Contractor and such costs will be deducted from the payments otherwise due to the Contractor.

7. CORRECTION OF WORK AFTER FINAL PAYMENT

Neither the final certificate nor payment nor any provision in the Contract Documents shall relieve the Contractor of responsibility for faulty materials or workmanship and, unless otherwise specified, Contractor shall remedy any defect due thereto and pay for any damage to other Work resulting therefrom, which shall appear within a period of one year from Date of Final Acceptance. Wherever the word "acceptance" occurs, it shall be understood to mean final acceptance.

The Owner shall give notice of observed defects with reasonable promptness. If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after the receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense. With respect to all warranties, expressed or implied, from subcontractors, manufacturer, or suppliers for Work performed and materials furnished under this Contract, the Contractor shall:

- A. Obtain all warranties that would be given in normal commercial practice.
- B. Require all warranties to be executed, in writing, for the benefit of the Owner.

8. USE OF EXPLOSIVES

When the use of explosive is necessary for the prosecution of the Work, the Contractor shall exercise the utmost care not to endanger life or property, including new Work. The Contractor shall be responsible for all damages resulting from the use of explosives. Blasting shall be performed in accordance with Section 220 of the NCDOT Standard Specifications.

9. DELIVERY OF GOODS / MATERIALS.

Unless otherwise provided in the Bid Documents, prices shall be F.O.B. Hickory, North Carolina and include packing, handling and shipping charges fully prepaid by the Contractor.

10. QUALITY CONTROL SERVICES

- A. Contractor Responsibilities: Contractor is responsible for its own quality control testing and inspection to insure the quality of its means and methods of construction will produce the specified quality of Work, and for any tests and inspections required by regulatory agencies. Costs

for these services shall be included in the Bid. The Contractor may employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified, or these services may be performed by qualified contractor personnel. The Contractor shall submit for Engineer's approval a quality control (QC) Plan delineating his methods for each item requiring inspections, tests, and similar services within fourteen (14) working days before of the Notice to Proceed date.

- B. Retest Responsibility: Where results of required inspections, tests, or similar services prove unsatisfactory and do not indicate compliance with the requirements of the Contract Documents, then retests are the responsibility of the Contractor, and shall be deducted from monies due the Contractor on the applicable pay request. Retesting of work revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original work.
- C. Repair and Protection. Upon completion of inspection, testing, sample-taking, and similar services performed on the Work, the Contractor shall repair damaged work and test sites to eliminate deficiencies. The Contractor shall protect work exposed by or for quality control service activities and protect repaired Work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

11. PROSECUTION AND PROGRESS

Within ten (10) days after notice of award, the Contractor shall prepare and submit for the Owner's review a proposed baseline schedule that is a fixed project timeline used for tracking progress for the entire duration of the project (the "Baseline Schedule"). The Baseline Schedule shall include critical path activities, contract milestones, and budgetary compliance as described below. After submittal, the City Project Manager shall schedule a meeting with the Contractor to review the proposed Baseline Schedule and identify any changes or corrections. The Contractor shall make any necessary adjustments to address all review comments and resubmit the Baseline Schedule for the City Project Manager's approval. Acceptance of the Baseline Schedule by the Owner does not revise the Contract Documents.

Submission of an incomplete or impractical Baseline Schedule by the Contractor may delay Owner's issuance of Notice to Proceed. All subsequent monthly schedule updates will be measured against the accepted Baseline Schedule. No payments will be processed for the Project prior to approval and acceptance of a Baseline Schedule. The accepted Baseline Schedule should not be changed throughout the life of the project without Owner's prior written approval.

12. NO DAMAGES FOR DELAY

In all cases where the Contractor is delayed, obstructed, or hindered in the execution of the Work, or any part thereof, except to the extent the delay, obstruction or hindrance is caused solely by Owner, the Contractor shall not be entitled to claim or recover any damages or additional payment from the Owner. However, it is the intent of this Contract that in all cases where the Contractor is substantially delayed, obstructed, or hindered in the execution of the Work through no fault of the Contractor and/or because of conditions beyond the Contractor's control, the Contractor may request a time extension in accordance with the procedures set forth in Section 17 above. Any time extensions granted under this Section shall be the exclusive remedy of the Contractor for delay, hindrance or obstruction occurring through no fault of the Contractor and/or because of conditions beyond the Contractor's control.

13. SUBLETTING AND ASSIGNMENT

The Owner will not recognize any subcontractor on the Work. The Contractor shall at all times when work is in progress be represented either in person or by a qualified superintendent or other representative who is duly authorized to receive and execute orders of the Engineer.

Should the Contractor elect to assign his/her contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be consummated only on the written approval of the Owner. In case of approval, the Contractor shall file copies of all subcontracts and/or assignments with the Owner.

14. GUARANTEE

The Contractor shall guarantee all materials and workmanship for a period of one (1) year from the date of acceptance by the Owner and shall replace any portions that fail because of faulty materials or workmanship at no additional cost to the Owner. A six (6) month and eleven (11) month inspection will be held during the warranty period. The Contractor shall immediately repair all defective items upon notification. Items repaired under the provisions shall have an extended warranty period of twelve (12) months from the date of repair of the item.

15. NO ADVERTISING OR PUBLICITY

Contractor shall not, without the prior written consent of Owner, use the Project, or any information related to the Project, including but not limited to photographs, renderings, descriptions, specifications, plans, drawings, or other materials related to the Project, for advertising, marketing, promotional, publicity, or any other commercial purposes. This prohibition includes, but is not limited to, the use of the Project in Contractor's portfolio, website, social media accounts, brochures, press releases, interviews, case studies, industry publications, trade shows, competitions, or any other form of public or private display or communication intended to promote Contractor's business interests.

C. FEDERAL REQUIREMENTS (IF APPLICABLE)**1. GENERAL CIVIL RIGHTS PROVISIONS**

The Contractor agrees to comply with pertinent statutes, Executive Orders and such rules as identified in Title VI List of Pertinent Nondiscrimination Acts and Authorities to ensure that no person shall, on the grounds of race, color, national origin (including limited English proficiency), creed, sex (including sexual orientation and gender identity), age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision is in addition to that required by Title VI of the Civil Rights Act of 1964.

The above provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract.

2. CIVIL RIGHTS – TITLE VI ASSURANCES**A. TITLE VI SOLICITATION NOTICE**

The Owner, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 USC §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders or offerors that it will affirmatively ensure that for any contract entered into pursuant to this advertisement, businesses will be afforded full and fair opportunity to submit bids in response to this invitation and no businesses will be discriminated against on the grounds of race, color, national origin (including limited English proficiency), creed, sex (including sexual orientation and gender identity), age, or disability in consideration for an award.

B. TITLE VI LIST OF PERTINENT NONDISCRIMINATION ACTS AND AUTHORITIES

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “Contractor”) agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 USC § 2000d et seq., 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination in Federally-Assisted programs of the Department Of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 USC § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973 (29 USC § 794 et seq.), as amended (prohibits discrimination on the basis of disability); and 49 CFR part 27 (Nondiscrimination on the Basis of Disability in Programs or Activities Receiving Federal Financial Assistance);

- The Age Discrimination Act of 1975, as amended (42 USC § 6101 et seq.) (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982 (49 USC § 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987 (PL 100-259) (broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990 (42 USC § 12101, et seq) (prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities) as implemented by U.S. Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration’s Nondiscrimination statute (49 USC § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations (ensures nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations);
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs [70 Fed. Reg. 74087 (2005)];
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 USC § 1681, et seq).

C. COMPLIANCE WITH NONDISCRIMINATION REQUIREMENTS

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “Contractor”), agrees as follows:

1. Compliance with Regulations: The Contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. Nondiscrimination: The Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin (including limited English proficiency), creed, sex (including sexual orientation and gender identity), age, or disability in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.
3. Solicitations for Subcontracts, including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the contractor's obligations under this contract and the Nondiscrimination Acts and Authorities on the grounds of race, color, or national origin.
4. Information and Reports: The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the Sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.
5. Sanctions for Noncompliance: In the event of a Contractor's noncompliance with the nondiscrimination provisions of this contract, the Sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:
 - a. Withholding payments to the Contractor under the contract until the Contractor complies; and/or
 - b. Cancelling, terminating, or suspending a contract, in whole or in part.
6. Incorporation of Provisions: The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the Sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the Sponsor to enter into any litigation to protect the interests of the Sponsor. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

3. FAIR LABOR STANDARDS ACT

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part time workers.

The Contractor has full responsibility to monitor compliance to the referenced statute or regulation. The Contractor must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

4. OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. Contractor must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The Contractor retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). Contractor must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

D. CONTRACTOR'S AFFIDAVIT – RELEASE AND WAIVER OF CLAIMS

STATE OF: _____ COUNTY OF: _____

(Name)_____
(Title)_____, being first duly sworn, deposes and says that:
(Contractor)

1. The undersigned is authorized to execute this Affidavit, Release and Waiver of Claim on behalf of the Contractor and has personal knowledge of all facts set forth herein.
2. This Affidavit, Release and Waiver of Claim is made concerning the construction of the following project:

Project Name: Miracle of Hickory Park Modification, Project No.: 27-006

3. All payrolls, material bills, sales tax, social security tax, state and federal unemployment insurance, and all other liabilities and taxes owed by the Contractor and arising in any manner from the above-described project have been paid in full.
4. No claim or lien exists in favor of any supplier of materials or labor or in favor of any subcontractor furnishing materials or labor on the above-described project.
5. Notwithstanding the foregoing, if the City of Hickory or property of the City of Hickory is subject to any claim or lien which arises in any manner from the failure of the Contractor to pay any liability described above, the Contractor will indemnify and hold the City of Hickory harmless for any amount which the City of Hickory is required to pay to discharge such lien or settle such claim and further will pay the City of Hickory's expenses, costs, and attorney fees incurred in connection therewith.
6. All claims, suits, and proceedings of every name, description, or nature arising out of the above project against the City of Hickory, its officers, employees and agents have been settled.
7. The Contractor releases and waives any and all claims of every type and description which the Contractor may have against the City of Hickory arising in any manner from the construction of the above-described project.

Contractor's Signature

Subscribed and sworn before me this ____ day of _____, 2026.

Signature of Notary _____

of _____ County, State of _____

My Commission Expires: _____

Project Number: 27-006

E. STATE/COUNTY SALES/USE TAX STATEMENT

PROJECT: _____

CONTRACTOR/SUBCONTRACTOR: _____

PERIOD COVERED: _____

Vendor	Address	Invoice #	Net Invoice Amount	4.75% State Tax	2.00% Catawba County Tax	2.25% Alexander County Tax	0.5% Special Tax	Other	County Name
TOTALS:									

I certify that the foregoing statement of sales tax paid in connection with the referenced contract does not contain sales or use taxes paid on purchases of tangible personal property purchased by such contractors for use in performing the contract which does not annex to, affix to, or in some manner become a part of the building or structure being erected, altered, or repaired for the governmental entities as defined by G.S. 105-164.14(c), and is to the best of his/her belief true and correct.

Contractor's Signature

Subscribed and sworn before me this ____ day of _____, 2026.

Signature of Notary _____

of _____ County, State of _____

My Commission Expires: _____

SALES TAX CERTIFICATION INSTRUCTIONS:

1. Save blank copies of this certification if awarded the project; Certification to be completed and submitted with each invoice sent to the City.
2. All completed certifications should be notarized at the time of completion; if there is no sales tax to report, then write "Labor Only" across the form and submit.
3. All columns should be totaled at the bottom of the form.
4. Incomplete forms will not be accepted and contract payment may be delayed.
5. It is very important that the sales tax is broken down between the applicable state and county portions; and that the name of the county (in which point of delivery occurred) be stated correctly.

DESCRIPTION OF COLUMNS:

Vendor	Name of the company to which the sales tax was actually paid
Address	Address of the company to which the sales tax was paid
Invoice	Invoice Number
Date	Date of the Invoice
Net Amount	Net amount of the invoice (excluding tax)
State Tax	Amount of sales tax for North Carolina
County Tax	Amount of sales tax for the county
Special Tax	Amount of special sales tax paid to counties (only Mecklenburg, Durham, & Orange counties → 0.5%)
County Name	The name of the county which the goods changed hands

For questions, please call 828-323-7470.

F. CHANGE ORDER FORM

Change Order Number: _____
 Date: _____
 Project Name: _____
 Contractor Name: _____
 Contractor Address: _____

Description of Change

Item No.	Description	Cost (Addition/Deduction)

Financial Summary

Original Contract Amount	
Net Change by Previous Change Order(s)	
Net Change by this Change Order	
New Adjusted Contract Price	

Schedule Summary

Original Contract Time	
Contract Time Adjustments to Date	
Contract Time Adjustments for this Change Order	
New Adjusted Contract Time	

This Change Order represents full and final settlement for time and money for the work set forth in this Change Order, including not only all direct costs of Contractor such as labor, material, job overhead, and profit markup but also any costs for modifications or changes in sequence of work to be performed, delays, rescheduling, disruptions, extended direct or general overhead, acceleration, material or other escalation which includes wages and other impact costs. The completion date, contract price and all other terms, covenants and conditions of the above referenced contract, except as duly modified by this and previous change orders, if any, remain in full force and effect.

[SIGNATURES APPEAR ON FOLLOWING PAGE]

Project Number: 27-006

ACCEPTED:**CONTRACTOR:**

Name: _____

Signature: _____

Title: _____

Date: _____

OWNER:

Name: _____

Signature: _____

Title: _____

Date: _____

This instrument has been pre-audited in the manner required by the "Local Government Budget and Fiscal Control Act".

Finance Director_____
Date

NOTE: THIS FORM CHANGE ORDER IS PROVIDED FOR REFERENCE PURPOSES ONLY. THE OWNER RESERVES THE RIGHT TO MODIFY THE CHANGE ORDER FORMAT AS NECESSARY.

IV. PLANS AND SPECIFICATIONS

Plans and Specifications for this Project are deemed to be incorporated herein.

See attached PLANS AND SPECIFICATIONS AS PREPARED BY Benesch, titled “Miracle of Hickory Park”, dated August 26, 2026.

**Sandy Pines Park: Initial Phase
City of Hickory, NC**

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Miracle of Hickory Park Modifications
City of Hickory, NC

SECTION 01 10 00 - 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.
- B. City of Hickory Engineering Department Manual of Practice, current edition.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.
 - 2. Type of the Contract.
 - 3. Work phases.
 - 4. Use of premises.
 - 5. Work restrictions.
 - 6. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Miracle of Hickory Park Modification
 - Project Location:
Hickory, NC
- B. Owner: City of Hickory
 - 1. Owner's Representative:
Sam Abernethy, PE
Engineering Dept.
76 North Center Street
Hickory, NC 28061
- C. Landscape Architect/Civil Engineer: Benesch, 2359 Perimeter Pointe Parkway, Suite 350, Charlotte, NC 28208.
 - 1. Landscape Architect's Representative: Jon Wood, PLA CLARB
- D. Architect: CBSA Architects, 226 2nd St. NW, Hickory, NC 28603.
 - 1. Architect's Representative: Marty Beal, AIA
- E. The Work consists of the following: Construction and or installation including contractor's project management, coordination, scheduling staking, technical layout, site clearing and

Miracle of Hickory Park Modifications
City of Hickory, NC

grubbing, selective clearing, erosion control, earthwork, storm sewer, water & sanitary sewer services, concrete, asphalt, landscaping, prefabricated restroom building, accessible stage, grassing, and ancillary work illustrated in the contract documents.

- F. Owner Provided/Owner Installed: Contractor to coordinate construction and scheduling with Owner for the following elements:
1. New Playground Shade Structure
 2. Stage Canopy Structure
 3. Site Furnishings (Benches, Tables, Trash Receptacles)

1.4 TYPE OF CONTRACT

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

1.5 WORK PHASES

- A. The Work shall be conducted in one phase and shall be substantially complete and ready for occupancy with time specified in the Supplementary General Conditions.

1.6 PERMITS AND INSPECTIONS

- A. The Architect has applied for permits from the following local and state authorities. The Contractor shall remain responsible for any other required permits and regulatory approvals (including but not limited to the pre-engineered picnic shelter and restroom building).
1. NCDEQ: Sedimentation and Erosion Control
 2. City Zoning: Site Plan & Commercial Drainage
 3. City Utilities: Water & Tap / Public Sewer & Tap
- B. Permits: The Contractor shall contact each permitting authority and arrange to secure the permits.
1. Payment for permits and inspections shall be by the Contractor in accordance with the General Conditions. The Owner has already paid and applied for items #1-3 above.

1.7 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.
- B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways and Entrances: Keep driveways and entrances serving site clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

Miracle of Hickory Park Modifications
City of Hickory, NC

1.8 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, except otherwise indicated.
 - 1. Weekend Hours: Comply with City of Hickory noise ordinance.
 - 2. Early Morning Hours: Comply with City of Hickory noise ordinance.
 - 3. Hours for Utility Shutdowns: Comply with local utility company requirements.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- C. Existing Roadways and Sidewalks: Secure written approval from local and state authorities for roadway and sidewalk interruptions. Plan and coordinate Work to minimize the duration of disruptions. Provide warning signs, barricades, and detour signage.
 - 1. Do not proceed with roadway and sidewalk interruptions without written permission from local and state authorities.
 - 2. Do not proceed with roadway and sidewalk interruptions until warning signs, barricades, and detour signage is in place. Remove signs and barricades after Work is complete and acceptable to Architect.
- D. Noise: Comply with local noise ordinance.
- E. Parking and Storage: Confine parking for construction vehicles, storage trailers and storage of materials to areas within the Contract limits.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.
 - 1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 - 2. Division 01: Sections in Division 01 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)

END OF SECTION 01 10 00

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SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Division 01 Section "Allowances" for procedural requirements for handling and processing allowances.
 - 2. Division 01 Section "Unit Prices" for administrative requirements for using unit prices.
 - 3. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.

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- d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use AIA Document G709 for Proposal Requests or similar form provided by Contractor.

1.5 ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 14 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 14 days after such authorization.

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1.6 CHANGE ORDER PROCEDURES

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

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

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SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Allowances" for procedural requirements governing handling and processing of allowances.
 - 2. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 3. Division 01 Section "Unit Prices" for administrative requirements governing use of unit prices.
 - 4. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.

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2. Submit the Schedule of Values to Architect at earliest possible date but no later than fourteen (14) days before the date scheduled for submittal of initial Applications for Payment.
 3. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name, location, code, item, and state construction identification number.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
 6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
 8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

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- a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

Cost of mobilization may be included if an equal value is included for de-mobilization.

- 9. Provide itemize billing as requested for Owners accounting requirements.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment. Contractor's electronic spreadsheet versions are acceptable.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 - 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit four (4) signed and notarized original copies of each Application for Payment to Architect. Each copy shall include consent of surety, minority documentation for contract payments Appendix E, County Sales and Use Tax Report, Progress Report, and similar attachments.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of Values.
 - 3. Contractor's Construction Schedule (preliminary if not final).
 - 4. Products list.
 - 5. Schedule of unit prices.

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6. Submittals Schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
- G. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Documents G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

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SECTION 01 31 00 - 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. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Project meetings.
 - 2. Requests for Interpretation (RFI's).
- B. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
 - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

- 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. Make adequate provisions to accommodate items scheduled for later installation.
 - 3. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- 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.

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1. Prepare similar memoranda for Owner 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.
 9. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 SUBMITTALS

- A. Key Personnel Names: Within 10 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.6 PROJECT MEETINGS

- A. General: The Owner shall schedule and conduct construction meetings and produce minutes of these meetings.
- B. Preconstruction Conference: The Owner shall schedule and conduct a pre-construction meeting and produce minutes of this meeting.
1. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Critical work sequencing and long-lead items.
 - c. Designation of key personnel and their duties.

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- d. Procedures for processing field decisions and Change Orders.
 - e. Procedures for RFI's.
 - f. Procedures for testing and inspecting.
 - g. Procedures for processing Applications for Payment.
 - h. Distribution of the Contract Documents.
 - i. Submittal procedures.
 - j. Preparation of Record Documents.
 - k. Use of the premises.
 - l. Work restrictions.
 - m. Responsibility for temporary facilities and controls.
 - n. Construction waste management and recycling.
 - o. Parking availability.
 - p. Office, work, and storage areas.
 - q. Equipment deliveries and priorities.
 - r. First aid.
 - s. Security.
 - t. Progress cleaning.
 - u. Working hours.
2. Minutes: Architect will record and distribute meeting minutes.
- C. Progress Meetings: The Owner shall schedule and conduct monthly construction meetings and produce minutes of these meetings.
1. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
- a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.

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- 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) RFI's.
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
2. Minutes: Architect will record and distribute to Contractor the meeting minutes.
 3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - 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.

1.7 REQUESTS FOR INTERPRETATION (RFI's)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
 1. RFI's shall originate with Contractor. RFI's submitted by entities other than Contractor will be returned with no response.
 2. Coordinate and submit RFI's in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
 1. Project name.
 2. Date.
 3. Name of Contractor.
 4. Name of Architect.
 5. RFI number, numbered sequentially.
 6. Specification Section number and title and related paragraphs, as appropriate.
 7. Drawing number and detail references, as appropriate.
 8. Field dimensions and conditions, as appropriate.
 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 10. Contractor's signature.
 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

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- C. Hard-Copy RFI's: CSI Form 13.2A or similar form provided by Contractor.
 - 1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFI's: Software-generated form with substantially the same content as indicated above.
 - 1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow 10 working days for Architect's response for each RFI. RFI's received after 1:00 p.m. will be considered as received the following working day.
 - 1. The following RFI's will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFI's or RFI's with numerous errors.
 - 2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 - 3. Architect's action on RFI's that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 7 days of receipt of the RFI response.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within 7 days if Contractor disagrees with response.
- G. RFI Log: Prepare, maintain, and submit a tabular log of RFI's organized by the RFI number. Submit log monthly. Software log with not less than the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect.
 - 4. RFI number including RFI's that were dropped and not submitted.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's response was received.
 - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

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SECTION 01 32 00 - 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. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals Schedule.
 - 4. Daily construction reports.
 - 5. Field condition reports.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path. They 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.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

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- D. Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- G. Major Area: A story of construction, a separate building, or a similar significant construction element.
- H. Milestone: A key or critical point in time for reference or measurement.
- I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- J. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

- A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's final release or approval.
- B. Preliminary Construction Schedule: Submit two opaque copies.
 - 1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.
- C. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
- D. Daily Construction Reports: Submit two copies at monthly intervals.
- E. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

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1.5 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including work stages and interim milestones.
 4. Review delivery dates for Owner-furnished products.
 5. Review schedule for work of Owner's separate contracts.
 6. Review time required for review of submittals and resubmittals.
 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 8. Review time required for completion and startup procedures.
 9. Review and finalize list of construction activities to be included in schedule.
 10. Review submittal requirements and procedures.
 11. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from parties involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 2. Initial Submittal: Submit concurrently with Preliminary Construction Schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

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- a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
- 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Construction Schedule Type: At Contractor's option, provide one of the following Construction Schedule types:
 - a. Gantt-Chart.
 - b. CPM Schedule.
- C. 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.
- D. Activities: Treat each story or separate area as a separate numbered activity for each principal 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 Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - 4. Startup and Testing Time: Include not less than one day for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- E. 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. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 2. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.

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- c. Uninterruptible services.
 - d. Use of premises restrictions.
 - e. Provisions for future construction.
 - f. Seasonal variations.
- F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.
- H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- 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 to Proceed. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was 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 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.5 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, time-scaled CPM network analysis diagram for the Work.
- 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.

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- a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and Special Inspections.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- D. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.

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7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.

E. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.6 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. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions.
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. Construction Change Directives received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial Completions and occupancies.
18. Substantial Completions authorized.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation (RFI). Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

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PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. 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 Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

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SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
 - 3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
 - 4. Division 01 Section "Quality Requirements" for submitting test and inspection reports.
 - 5. Division 01 Section "Closeout Procedures" for submitting warranties.
 - 6. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 7. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 8. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in estimating quantities and preparing submittals. These files will not be considered part of the contract documents. Contractor shall fill out and submit a release form for the files.

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- 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. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
- E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- F. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

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- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
1. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.
1. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number numbered consecutively.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
 - m. Signature of transmitter.
 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- I. 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 "Approved as Submitted" or "Approved as Noted".
- J. 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.
- K. Use for Construction: Use only final submittals with mark indicating "Approved as Submitted" or "Approved as Noted" taken by Architect.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

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1. Execution by Contractor of waiver provided by Architect.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 4. Submit Product Data before or concurrent with Samples.
 5. Number of Copies: Submit three copies of Product Data, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.

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- g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
- 2. Submit Shop Drawings as pdfs.
 - 3. Architect will mark up and return pdfs to Contractor and Owner. Architect will maintain one copy as a Project Record Drawing.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 4. Samples for Selection: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; 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.

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- 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.
- E. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- F. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- G. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- H. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of 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.
 4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Architect will return two copies.
 - a. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
 2. Certificates and Certifications: Provide a notarized 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.
 3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

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- E. Installer Certificates: Prepare 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.
- F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- J. Product Test Reports: Prepare written reports indicating 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.
- K. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- L. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- M. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- N. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- O. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

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- P. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- Q. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- R. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- S. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- T. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- U. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.
1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

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2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of 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.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - 1. "Approved as Submitted", "Approved as Noted", or "Not Approved, Revise and resubmit".
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

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- D. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 33 00

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SECTION 01 40 00 - 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. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Division 01 Section "Allowances" for testing and inspecting allowances.
 - 2. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 3. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 4. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and

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completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

- C. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- D. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- E. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- G. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- H. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 SUBMITTALS

- A. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.

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2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of inspector.
 13. Recommendations on retesting and reinspecting.
- B. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. 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.
- D. 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.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

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2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

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

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. 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.
 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. 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.
- E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify

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agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. 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 inspecting equipment at Project site.

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

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

1.8 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
- B. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:

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1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
 - 2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Division 01 Section "Execution" for progress cleaning requirements.
 - 4. Divisions 02 through 49 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weather tight; exterior walls are insulated and weather tight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, 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.

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1.5 SUBMITTALS

1.6 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS (OPTIONAL)

- A. Pavement: Comply with Division 32 pavement Sections.
- B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts.

2.2 TEMPORARY FACILITIES (OPTIONAL)

- A. Field Offices: The contractor has the option to provide prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
 - 1. Provide office furniture and equipment to accommodate needs of construction personnel and construction operations.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

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1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

3.2 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. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 1. Install electric power service overhead, unless otherwise indicated.

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- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - a. Telephone Service: Provide superintendent with cellular telephone.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
 - 2. Maintain support facilities until near Substantial Completion. 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 non-tracking. Reapply treatment as required to minimize dust.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.
- E. 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 nor endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- F. Project Identification and Temporary Signs: Provide Project identification and other signs as indicated on Drawings. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
 - 1. Provide temporary, directional signs for construction personnel and visitors.
 - 2. Maintain and touchup signs so they are legible at all times.
- G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

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1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

- I. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that 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 Division 01 Section "Summary."

- B. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Division 31 Section "Site Clearing."

- C. Storm water Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of storm water from heavy rains.

- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

- 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. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates. This item is contractor's option.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations or as indicated on Drawings.

2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.

3. Use existing fence located on the site to the greatest extent possible to secure the site.

- G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. This item is contractor's option

- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting. This item is contractor's option.

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- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather tight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- J. 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.
 - 1. Prohibit smoking in hazardous fire-exposure areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to 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.

3.5 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 paving not intended for or acceptable for integration into permanent paving. 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, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

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END OF SECTION 01 50 00

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SECTION 01 56 39 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Sections:
 - 1. Division 01 Section "Temporary Facilities and Controls" for temporary site fencing.
 - 2. Division 31 Section "Site Clearing" for removing existing trees and shrubs.

1.3 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at 6 inches above the ground for trees up to, and including, 4-inch size; and 12 inches above the ground for trees larger than 4-inch size.
- B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.
- C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 SUBMITTALS

- A. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
 - 1. Species and size of tree.
 - 2. Location on site plan. Include unique identifier for each.
 - 3. Reason for pruning.
 - 4. Description of pruning to be performed.
 - 5. Description of maintenance following pruning.
- B. Qualification Data: For qualified arborist and tree service firm.

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- C. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- D. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- E. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
 - 1. Use sufficiently detailed photographs or videotape.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.5 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by ISA Licensed arborist in jurisdiction where Project is located.
- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
 - a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
 - b. Enforcing requirements for protection zones.
 - c. Arborist's responsibilities.
 - d. Field quality control.

1.6 PROJECT CONDITIONS

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

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch (25 mm) in diameter; and free of weeds, roots, and toxic and other nonsoil materials.
 - 1. Obtain topsoil only from well-drained sites where topsoil is 4 inches deep or more; do not obtain from bogs or marshes.
- B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
 - 1. Type: Ground or shredded bark Wood and bark chips.
 - 2. Size Range: 3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum.
 - 3. Color: Natural.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements.
 - 1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch- diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- OD line posts, and 2-7/8-inch- OD corner and pull posts; with 1-5/8-inch- (42-mm-) OD top rails; with 0.177-inch- (4.5-mm-) diameter top tension wire and 0.177-inch- diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
 - a. Height: 4 feet (1.2 m).
 - 2. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch (50-mm) maximum opening in pattern and weighing a minimum of 0.4 lb/ft. (0.6 kg/m); remaining flexible from minus 60 to plus 200 deg F (minus 16 to plus 93 deg C); inert to most chemicals and acids; minimum tensile yield strength of 2000 psi (13.8 MPa) and ultimate tensile strength of 2680 psi (18.5 MPa); secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 8 feet (2.4 m) apart.
 - a. Height: 4 feet (1.2 m).
 - b. Color: High-visibility orange, nonfading.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag each tree trunk or tree line at 54 inches (1372 mm) above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.3 TREE- AND PLANT-PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation. Install at locations shown on plans.
 - 1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
 - 2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
- B. Maintain protection zones free of weeds and trash.
- C. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
- D. Maintain protection-zone fencing in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
 - 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.

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3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division 31 Section "Earth Moving."
- B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

- A. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:
 - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - 2. Cut Ends: Do not paint cut root ends.
 - 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 - 4. Cover exposed roots with burlap and water regularly.
 - 5. Backfill as soon as possible according to requirements in Division 31 Section "Earth Moving."
- B. Root Pruning at Edge of Protection Zone: Prune roots 12 inches (300 mm) inside of the protection zone, by cleanly cutting all roots to the depth of the required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:

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1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
2. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
3. Cut branches with sharp pruning instruments; do not break or chop.
4. Do not apply pruning paint to wounds.

B. Chip removed branches and dispose of off-site.

3.7 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
 1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.
- C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- D. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

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

3.9 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
 1. Submit details of proposed root cutting and tree and shrub repairs.
 2. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
 3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
 4. Perform repairs within 24 hours.
 5. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Trees: Remove and replace trees indicated to remain that are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

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1. Provide new trees of same size and species as those being replaced for each tree that measures 6 inches (150 mm) or smaller in caliper size or as required by the City of Hickory Landscape Ordinance (whatever requirement is greater).
 2. Provide two new trees of 6-inch (150-mm) caliper size for each tree being replaced that measures more than 6 inches (150 mm) in caliper size or as required by the City of Hickory Landscape Ordinance (whatever requirement is greater).
 3. Plant and maintain new trees as specified in Division 32 Section "Plants" or as required by the City of Hickory Landscape Ordinance (whatever requirement is greater).
- C. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 feet (3 m) beyond drip line and no closer than 36 inches (900 mm) to tree trunk. Drill 2-inch- (50-mm-) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) o.c. Backfill holes with an equal mix of augered soil and sand.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

END OF SECTION 01 56 39

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SECTION 01 60 00 - 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. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 01 Section "Allowances" for products selected under an allowance.
 - 2. Division 01 Section "Alternates" for products selected under an alternate.
 - 3. Division 01 Section "References" for applicable industry standards for products specified.
 - 4. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
 - 5. Divisions 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, 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. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

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- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 3. Completed List: Within 30 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 4. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

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- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and 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. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. 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.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 10 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 21 days of receipt of request, or 14 days of receipt of additional information or documentation, whichever is later.
- a. Form of Acceptance: Change Order.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 15 days of receipt of additional information or documentation.
- a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
 - b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.
- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

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1.5 QUALITY ASSURANCE

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

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

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: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

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2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies

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with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
8. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within 30 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 1. 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 Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 2. Requested substitution does not require extensive revisions to the Contract Documents.

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3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. 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.

2.3 COMPARABLE PRODUCTS

- A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

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SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
 - 3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

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1.4 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: 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 and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: 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. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

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5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

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. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 3. Inform installers of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 6. 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 invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and

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electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

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

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

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- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

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1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 7 days during normal weather or 3 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, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- 3.8 STARTING AND ADJUSTING
- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

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- 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: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

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

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

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SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Divisions 02 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

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

1.4 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.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's or site improvement's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

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1.5 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.

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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 and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit 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. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 29

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SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 01 Section "Execution" for progress cleaning of Project site.
 - 3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 5. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 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, and similar final record information.

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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. Complete startup testing of systems.
8. Terminate and remove temporary facilities from Project site, construction tools, and similar elements.
9. Advise Owner of changeover in utilities.
10. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
11. Complete final cleaning requirements, including touchup painting.
12. 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, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. 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.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect'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. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

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1.5 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. Organize list in sequential order.
 - 2. Organize items applying to each major element, including categories for grading, utilities, landscaping, paving, site improvements, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- 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.

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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 cleaning 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. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. 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.
 - j. Remove labels that are not permanent.
 - k. 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.
 - l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Replace parts subject to unusual operating conditions.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

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- o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. 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.
 - r. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. 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.

END OF SECTION 01 77 00

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SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation manuals for systems, subsystems, and equipment.
 - 2. Maintenance manuals for the care and maintenance of products, materials, and finishes and systems and equipment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
 - 3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 - 4. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
 - 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

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1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name, address, and telephone number of Contractor.
 - 6. Name and address of Architect.
 - 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 - 1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

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- b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. System, subsystem, and equipment descriptions.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 1. Product name and model number.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:

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1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

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2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard printed maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

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PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."
- E. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

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SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Miscellaneous Records.
- B. Related Sections include the following:
 - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal: Submit one set of marked-up Record Prints. Architect will mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return prints for corrections and final submittal.
 - b. Final Submittal: Make corrections noted on initial submittal and submit one set of marked-up Record Prints, Submit each Drawing, whether or not changes and additional information were recorded.
- B. Miscellaneous Records: Submit one copy of miscellaneous records.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

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1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

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1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

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SECTION 02 41 19 - SELECTIVE DEMOLITION

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. Demolition and removal of selected site elements.
 - 2. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
 - 3. Section 017300 "Execution" for cutting and patching procedures.
 - 4. Section 013516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
 - 5. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. 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.

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- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.
 - 2. Review areas where existing construction is to remain and requires protection.

1.5 SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 FIELD CONDITIONS

- A. Owner will occupy buildings immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
- E. Storage or sale of removed items or materials on-site is not permitted.

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- F. 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.

1.8 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 ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Contact North Carolina 811 for utility locate prior to any excavation. Contact owner for identification of any other known utilities.
- D. Retain "Steel Tendons" Paragraph below if selective demolition includes pretensioned or post-tensioned concrete slabs.
- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
 - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
 - 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

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3.2 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain.
 - 1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

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. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 2. 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. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

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- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, 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 or Asphalt pavement: Full Depth 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.

END OF SECTION 02 41 19

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes cast-in-place concrete, including reinforcement, concrete materials, mix design, placement procedures, and finishes for steps (exterior) leading from the unloading and loading/drop-off area to the building entrance.

1.2 SUBMITTALS

- A. Product Data: For each manufactured material and product indicated.
- B. Design Mixes: For each concrete mix indicated.
- C. Shop Drawings: Include details of steel reinforcement placement including material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports.
- D. Material certificates.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- B. Comply with ACI 301, "Specification for Structural Concrete," including the following, unless modified by the requirements of the Contract Documents:
 - 1. General requirements, including submittals, quality assurance, acceptance of structure, and protection of in-place concrete.
 - 2. Formwork and form accessories.
 - 3. Steel reinforcement and supports.
 - 4. Concrete mixtures.
 - 5. Handling, placing, and constructing concrete.
- C. Once all submittals have been submitted, reviewed and approved, the contractor shall schedule a pre-installation meeting on-site with the subcontractor, Architect, Engineer and Special Inspector in attendance.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Formwork: Furnish formwork and form accessories according to ACI 301.
- B. Steel Reinforcement:
 - 1. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
 - 2. Plain-Steel Wire: ASTM A 82, as drawn.

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3. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
 4. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- C. Concrete Materials:
1. Portland Cement: ASTM C 150, Type I.
 2. Normal-Weight Aggregate: ASTM C 33, uniformly graded, not exceeding 1-1/2-inch nominal size.
 3. Lightweight Aggregate: ASTM C 330.
 4. Water: Complying with ASTM C 94.
- D. Admixtures:
1. Air-Entraining Admixture: ASTM C 260.
 2. Water-Reducing Admixture: ASTM C 494, Type A.
 3. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
 5. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 6. Color Conditioning Concrete Admixture: L.M. Scolfield Chromex or approved equal. Color as indicated on the Drawings or if not indicated, the Architect shall select from a full selection of available colors.
- H. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- I. Curing Materials:
7. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 8. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf.
 9. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
 10. Water: Potable.
 11. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- J. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D448, size 57, with 100% passing a 1 ½ inch sieve and 0 to 5% passing a No. 8 sieve.
- K. Sealing Materials
12. Sealer and Dustproofer: A heavy duty, water base acrylic emulsion sealer containing a minimum of 20 percent solids and that is v.o.c. compliant.
- 2.2 CONCRETE MIXES
- A. Comply with ACI 301 requirements for concrete mixtures.
- B. Prepare design mixes, proportioned according to ACI 301, for normal-weight concrete determined by either laboratory trial mix or field test data bases, as follows:
1. Compressive Strength (28 Days): As indicated on structural drawings.
 2. Slump: As indicated on structural drawings.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 6.0 percent within a tolerance of plus 1.0 or minus 1.5 percent at exposed formed concrete.

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1. Air content of trowel-finished interior concrete floors shall not exceed 2.0 percent.
- D. The design mix for concrete containing a color admixture shall be developed with and approved by the admixture supplier.
 1. No calcium chloride is permitted in colored concrete

2.3 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with ASTM C 94.
 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.
- B. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Formwork: Design, construct, erect, shore, brace, and maintain formwork according to ACI 301.
- B. Vapor Retarder: Install, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's instructions.
 1. Place sheets in position with longest dimension parallel with direction of the pour.
 2. Lap vapor retarder over footings and seal to foundation walls.
 3. Lap joints 6 inches and seal with manufacturer's recommended tape.
 4. Seal all penetrations as per manufacturer's instructions.
 5. To repair damaged areas: Cut patches of vapor retarder, overlap damaged area 6 inches and tape all sides with manufacturer's recommended tape.
- C. Steel Reinforcement: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- D. Joints: Construct joints true to line with faces perpendicular to surface plane of concrete.
 1. Construction Joints: Locate and install so as not to impair strength or appearance of concrete, at locations indicated or as approved by Architect.
 2. Isolation Joints: Install joint-filler strips at junctions of slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - a. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 3. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

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- a. 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 concrete develops random contraction cracks.
- E. Tolerances: Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

3.2 CONCRETE PLACEMENT

- A. Comply with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Consolidate concrete with mechanical vibrating equipment.
- D. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing.
 - 1. In cold weather comply with ACI 306.
 - 2. In hot weather comply with ACI 305.

3.3 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Completely remove fins and other projections.
 - 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 - 2. Do not apply rubbed finish to smooth-formed finish.
 - 3. Apply smooth-rubbed finish, defined in ACI 301, to smooth-formed finished concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.4 FINISHING UNFORMED SURFACES.

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

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- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on the surface.
 - 1. Do not further disturb surfaces before starting finishing operations.
- C. Scratch Finish: Apply scratch finish to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finish, unless otherwise indicated.
- D. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- E. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
- F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- G. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.5 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection, and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions occur before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Cure formed and unformed concrete for at least seven days as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist with absorptive cover, water saturated and kept continuously wet.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

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3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Tests will be performed according to ACI 301.
 - 1. Testing Frequency: At least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

END OF SECTION

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SECTION 22 11 13

WATER DISTRIBUTION FACILITY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. City of Hickory Engineering Department Manual of Practice, current edition, section 500 Water Systems shall apply to the construction of all water main, water line(s) (water, fire etc), service lines, meters, backflow devices and related appurtenances.

1.2 SUMMARY

This Section includes piping and specialties for potable-water service, fire protection service, and related components outside the building.

- B. Utility companies usually provide water meters and bill charges directly or through Contractor to Owner. Contact utility company serving the site for specific information.

DEFINITIONS

- A. The following are industry abbreviations for plastic and rubber materials:
 - 1. DIP: Ductile Iron Pipe
 - 2. PVC: Polyvinyl chloride
 - 3. LLDPE: Linear, low-density polyethylene plastic
 - 4. PE: Polyethylene plastic
 - 5. PP: Polypropylene plastic

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressures: The following are minimum pressure requirements for piping and specialties, unless otherwise indicated:
 - Potable-Water Service: 160 psig (1100 kPa).
 - 2. Fire Protection – Water Service: 200 psig (1378 kPa).

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Backflow preventers.
 - 2. Pipe and fittings.

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- B. Record Drawings: At Project closeout of installed water-service piping according to Division 1 Section "Closeout Procedures."
- C. As Built of Water Main/Water Line(s) and Fire Line system completion. See Section 22 11 13 Water Distribution Facility, Part 3.13 for additional information.
- D. Test Reports: As specified in "Field Quality Control" Article in Part 3.
- E. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.
- F. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 1. Include data for the following:
 - Backflow Preventers.
 - 2. Meters

1.6 QUALITY ASSURANCE

Product Options: Drawings indicate size, profiles, and dimensional requirements of water-service piping specialties and are based on specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

- B. Comply with requirements of utility supplying water. Include connection to water mains and backflow prevention.
- C. Comply with standards of authorities having jurisdiction for potable water-service piping. Include materials, installation, testing, and disinfection.
- D. Comply with NSF 61, "Drinking Water System Components--Health Effects," for materials for potable water.
- E. Comply with NFPA 70, "National Electrical Code," for electrical connections between wiring and electrically operated devices.
- F. Provide listing/approval stamp, label, or other marking on piping and specialties made to specified standards.
- G. Listing and Labeling: Provide electrically operated specialties and devices specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends and flange faces.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
 - 1. Do not remove end protectors, unless necessary for inspection; then reinstall for storage.

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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 valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver 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. Verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Verify that water-service piping may be installed to comply with original design and referenced standards.
- C. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.9 SEQUENCING AND SCHEDULING

- A. Coordinate connection to water main with utility company.
- B. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Gate Valves: (Comply with utility requirements)
 - a. American AVK Co.
 - b. American Cast Iron Pipe Co.; American Flow Control Div.
 - c. American Cast Iron Pipe Co.; Waterous Co.
 - d. East Jordan Iron Works, Inc.
 - e. Grinnell Corp.; Grinnell Supply Sales Co.
 - f. Grinnell Corp.; Mueller Co.; Water Products Div.
 - g. Hammond Valve Corp.

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- h. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa)
 - i. McWane, Inc.; Kennedy Valve Div.
 - j. McWane, Inc.; Tyler Pipe; Utilities Div.
 - k. Milwaukee Valve Co., Inc.
 - l. Nibco, Inc.
 - m. Pratt: Henry Pratt Co.
 - n. Stockham Valves & Fittings, Inc.
 - o. United States Pipe & Foundry Co.
2. Indicator Posts and Indicator Gate Valves: (Comply with utility requirements)
- a. American Cast Iron Pipe Co.; American Flow Control Div.
 - b. American Cast Iron Pipe Co.; Waterous Co.
 - c. Grinnell Corp.; Grinnell Supply Sales Co.
 - d. Grinnell Corp.; Mueller Co.; Water Products Div.
 - e. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa)
 - f. McWane, Inc.; Kennedy Valve Div.
 - g. Nibco, Inc.
 - h. Penn-Troy Machine Co.
 - i. Stockham Valves & Fittings, Inc.
 - j. United States Pipe & Foundry Co.
 - k. American AVK Co.
3. Copper, Pressure Seal Fittings: (Comply with utility requirements)
- a. Viega; Plumbing & Heating Systems
4. Protective Enclosures: (Comply with utility requirements)
- a. Hot Box.
 - b. HydroCowl, Inc.
5. Back Flow Preventers: (Comply with utility requirements)

2.2 PIPES AND TUBE

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. Hard Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, drawn temper. Include copper, solder-joint fittings according to ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type
- C. Ductile-Iron, Push-on-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.
- D. Ductile-Iron, Mechanical-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.

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- E. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, annealed temper. Include copper, solder-joint fittings according to ASME B16.18, cast-copper alloy or ASME B16.22, wrought-copper, solder-joint pressure type.
- F. PVC Plastic Pipe: ASTM D 1785, with marking "NSF-pw" according to NSF 14.
- G. PVC Plastic, Fire-Service Pipe: UL 1285 and AWWA C900. Include elastomeric seal according to ASTM F 477.

2.3 PIPE AND TUBE FITTINGS

- A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
- B. Copper Fittings: ASME B16.22; wrought-copper, solder-joint pressure type.

2.4 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
- B. Refer to Division 2 Section "Utility Materials" for commonly used joining materials.
- C. Ductile-Iron Piping: The following materials apply:
 - 1. Push-on Joints: AWWA C111 rubber gaskets and lubricant.
 - 2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
- D. Primers for PVC Piping Solvent-Cement Joints: ASTM F 656.
- E. Solvent Cement for PVC Piping Solvent-Cement Joints: ASTM D 2564.
- F. Pipe Couplings: Iron-body sleeve assembly, fabricated to match OD of pipes to be joined.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.
 - 2. Followers: ASTM A 47 (ASTM A 47M), malleable iron; or ASTM A 536, ductile iron.
 - 3. Gaskets: Rubber.
 - 4. Bolts and Nuts: AWWA C111.
 - 5. Finish: Enamel paint.
- G. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.5 VALVES

- A. Nonrising-Stem, Resilient-Seated Gate Valves, 3-Inch NPS (DN80) and Larger: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 200-psig (1380-kPa) minimum working-pressure design, interior coating according to AWWA C550, and push-on- or mechanical-joint ends.
- B. Valve Boxes: Cast-iron box with top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches

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(125 mm) in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.

1. Provide steel tee-handle operating wrench with each valve box. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.
- C. Indicator Posts: UL 789, FM-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve.

2.6 WATER METERS

- A. The Contractor shall purchase water meters as specified by the Local Authorized Utility Department.

2.7 WATER-METER BOXES/VAULTS

- A. The Contractor shall purchase water meter boxes\vaults as specified by the Local Authorized Utility Department.

2.8 PROTECTIVE ENCLOSURES

- A. Description: Manufactured, weather-resistant enclosure designed to protect aboveground water piping equipment or specialties. Include size and dimensions indicated, but not less than those required for access and service of protected unit and the following:
1. Housing: Reinforced-aluminum or -fiberglass construction with locking capabilities.
 2. Drain opening for units with drain connection.
 3. Access doors with locking devices.
 4. Insulation inside housing.
 5. Electric heater with self-limiting temperature control. UL tested and approved.
 6. Anchoring devices to attach housing to rigid base.

2.9 BACKFLOW PREVENTERS

- A. General: Backflow preventer type shall be as noted on drawings. Manufacturer and model shall be approved by the Local Authorized Utility Department.

2.10 IDENTIFICATION

Warning Tape to be installed with underground utilities, manufactured for marking and identifying underground utilities. Made of solid blue film and continuously printed black letters 'Caution – Water Line Buried Below'.

- B. Arrange for Detectable Warning Tapes made of solid blue film with metallic core and continuously printed black letters 'Caution – Water Line Buried Below'.

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2.11 ACCESSORIES

- A. Warning Tape: See Section 31 20 00 Earthworks, Part 2.3 for additional information
- B. Detectable Warning Tape: See Section 31 20 00 Earthworks, Part 2.3 for additional information

2.11 FIRE HYDRANTS

- A. General: Fire Hydrant type shall be as noted on drawings. Manufacturer and model shall be approved by the Local Authorized Utility Department and Local Authorized Fire Department.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- C. Do not use flanges or keyed couplings for underground piping.
 - 1. Exception: Piping in boxes and structures, but not buried, may be joined with flanges or keyed couplings instead of joints indicated.
- D. Potable Water-Service Piping: Use the following:
 - 1. 1-3-Inch NPS (DN80): Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
 - 2. 1-3-Inch NPS (DN80): Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
 - 3. 1-3-Inch NPS (DN80): PVC plastic, Schedule 40 pipe; PVC plastic, Schedule 40, socket fittings; and solvent-cemented joints.
 - 4. 1-3-Inch NPS (DN80): K-Copper, ASTM B 88, Type K and ASTM B 88, Type L, water tube, drawn temper. Include copper, solder-joint fittings according to ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type
- E. Fire-Protection Water-Service Piping: Use the following:
 - 1. 4- to 8-Inch NPS (DN100 to DN200): Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
 - 2. 4- to 8-Inch NPS (DN100 to DN200): Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
 - 3. 4- to 8-Inch NPS (DN100 to DN200): PVC plastic, Class 200, AWWA C-900, fire-service pipe; ductile-iron fittings for PVC plastic pipe; and gasketed joints.

3.2 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

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1. Underground Valves, 3-Inch NPS (DN80) and Larger: AWWA, gate valves, nonrising stem, with valve box.
2. Underground Valves, 4-Inch NPS (DN100) and Larger: UL/FM, gate valves, nonrising stem, with indicator post.
3. Pit and Aboveground Installation Valves, 3-Inch NPS (DN80) and Larger: AWWA, OS&Y gate valves.
4. Pit and Aboveground Installation Valves, 2-1/2-Inch NPS (DN65) and Larger: UL/FM, OS&Y gate valves.
5. Pit and Aboveground Installation Valves, 2-Inch NPS (DN50) and Smaller: MSS, nonrising-stem gate valves.
6. Pit and Aboveground Installation Valves, 2-Inch NPS (DN50) and Smaller: UL/FM, OS&Y gate valves.

3.3 JOINT CONSTRUCTION

- A. Ductile-Iron Piping, Gasketed Joints: According to AWWA C600.
- B. Ductile-Iron Piping, Gasketed Joints for Fire-Service Piping: According to UL 194 and AWWA C600.
- C. PVC Piping, Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
- D. PVC Piping Solvent-Cement Joints: According to ASTM D 2672 and ASTM D 2855. Handle cleaner, primer, and solvent cement according to ASTM F 402.
- E. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, OD, and system working pressure. Refer to "Piping Systems - Common Requirements" Article below for joining piping of dissimilar metals.

3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- B. Install piping at indicated slope.
- C. Install components with pressure rating equal to or greater than system operating pressure.
- D. Install piping free of sags and bends.
- E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- F. Install fittings for changes in direction and branch connections.

3.5 PIPING INSTALLATION

- A. Water-Main Connection: A licensed utility contractor shall make connection to public water main.

3.6 ANCHORAGE INSTALLATION

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- A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
 - 1. Gasketed-Joint, Ductile-Iron, Potable-Water Piping: According to AWWA C600.
 - 2. Gasketed-Joint, PVC Potable-Water Piping: According to AWWA M23.
 - 3. Solvent Cement Joint-PVC.
 - 4. Fire-Service Piping: According to NFPA 24.
- B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

- A. General Application: Use mechanical-joint-end valves for 3-inch NPS (DN80) and larger underground installation. Use threaded- and flanged-end valves for installation in pits. Use nonrising-stem UL/FM gate valves for installation with indicator posts.
- B. AWWA-Type Gate Valves: Comply with AWWA C600. Install underground valves with stem pointing up and with cast-iron valve box.
- C. UL/FM-Type Gate Valves: Comply with NFPA 24. Install underground valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.

3.8 WATER-METER INSTALLATION

- A. Water meters shall be installed by a licensed utility contractor.

3.9 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to local authorized utility company requirements, as well as, the local plumbing codes.
- B. Support backflow preventers, valves, and piping on brick or concrete piers.

3.11 IDENTIFICATION INSTALLATION

- A. Install continuous plastic underground warning tape during back-filling of trench for underground water-service piping. Locate 8 to 12 inches (150 to 200 mm) above the proposed pipe, directly over piping.
- B. Install continuous plastic underground detectable warning tape during back-filling of trench for underground water-service piping. Locate 24-30 inches below finished grade, directly over piping.
- C. Attach nonmetallic piping label permanently to main electrical meter panel.

3.12 CLEANING

- A. Clean and disinfect water distribution piping per the Utility Department's requirements. If such requirements do not exist, complete as follows:
 - 1. Purge new water distribution piping and parts of existing piping 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, use procedure

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described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until no dirty water appears at points of outlet.

3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities, use procedure described in AWWA C651 or as described below:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
 - c. After allowed standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. The Contractor shall contact the local sewer department to arrange for disposal of the heavily chlorinated water to the sanitary sewer. If a sanitary sewer system is unavailable for disposal of the chlorinated water, an alternative disposal site must be selected.
- C. The proposed alternative disposal site to which the chlorinated water is to be discharged shall be inspected and approved by the Engineer. A reducing agent shall be applied to the chlorinated water to be wasted to completely neutralize the chlorine residual remaining in the water. (See Table for neutralizing chemicals.) Where necessary, federal, state and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

Pounds of Chemicals Required to Neutralize Various Residual Chlorine Concentrations in 1,000,000 Gallons of water				
Residual Chlorine Concentration (mg/l)	Sulfur Dioxide Bisulfate (SO₂)	Sodium Sulfite (NaHSO₃)	Sodium Thiosulfate (NaSO₃)	Sodium (Na₂S₂O₃·5H₂O)
1	0.8	1.2	1.4	1.2
2	1.7	2.5	2.9	2.4
10	8.3	12.5	14.6	12.0
50	41.7	62.6	73.0	60.0

- D. Prepare reports for purging and disinfecting activities.

3.13 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after 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 1-1/2 times working pressure for 2 hours.
 1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for one more hour.

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Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints.
 Remake leaking joints with new materials and repeat test until leakage is within above limits.

2. The specified test pressure, measured at the point of lowest elevation, shall then be applied by means of a pump connected to the pipe in a manner satisfactory to the Authority and/or Engineer. If the elevation of the high point of the pipeline being tested is such that the pressure during testing will be below 85 percent of the required test pressure, the test pressure shall not vary by more than ± 5 psi and the test shall be at least a 2-hour duration.
3. A leakage test shall be conducted concurrently with the pressure test. Leakage is defined as the quantity of the water measured as make-up water (volumetrically in a container or meter) that must be supplied into the newly laid pipeline to maintain pressure within 5psi of the test pressure after the air in the pipeline has been expelled and the pipe filled with water.
4. No pipeline installation shall be accepted by the Authority and/or Engineer if the leakage is greater than that shown in Table 1. The table has been generated from the formula:

$$L = \frac{SD(P)^{1/2}}{148,000}$$

Where L is the allowable leakage in gallons per hour, S equals the length of pipe in feet, D is the nominal pipe diameter in inches, and P is the test pressure in psig.

TABLE 1 - ALLOWABLE LEAKAGE PER 1,000 FEET OF PIPELINE* (GPH)											
Avg. Test Pressure (psi)	Nominal Pipe Diameter (Inches)										
	4	6	8	12	16	20	24	30	36	42	48
100	0.30	0.45	0.60	0.90	1.20	1.50	1.80	2.25	2.70	3.15	3.60
125	0.34	0.50	0.67	1.01	1.34	1.66	2.01	2.50	3.00	3.50	4.00
150	0.37	0.53	0.74	1.11	1.47	1.83	2.22	2.75	3.30	3.85	4.40
175	0.40	0.57	0.80	1.19	1.59	1.98	2.39	2.95	3.55	4.15	4.75
200	0.43	0.61	0.85	1.26	1.70	2.12	2.56	3.15	3.80	4.45	5.09

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225	0.4 5	0.4 9	0.9 0	1.3 5	1.8 0	2.2 5	2.7 0	3.3 8	4.0 5	4.7 9	5.4 1
250	0.4 7	0.7 1	0.9 5	1.4 2	1.9 0	2.3 7	2.8 5	3.5 6	4.2 7	4.9 9	5.7 0
275	0.5 0	0.7 5	1.0 0	4.4 9	4.9 9	2.4 9	2.9 9	3.7 3	4.4 8	5.2 3	5.9 8
300	0.5 2	0.7 8	1.0 4	1.5 6	2.0 8	2.6 0	3.1 2	3.9 0	4.6 8	5.4 6	6.2 4
350	0.5 6	0.8 4	1.1 2	1.6 9	2.2 5	2.8 1	3.3 7	4.2 1	5.0 6	5.9 0	6.7 4
400	0.6 0	0.9 0	1.2 0	1.8 0	2.4 0	3.0 0	3.6 0	4.5 0	5.4 1	6.3 1	7.2 1
450	0.6 4	0.9 5	1.2 7	1.9 1	2.5 5	3.1 8	3.8 2	4.7 8	5.7 3	6.6 9	7.6 4

- C. Prepare reports for testing activities.
- D. As Built: Sealed survey required prior to acceptance indicating vertical, horizontal locations, materials etc of the entire system, see below.

As Built; Contractor shall provide a field verify record documented conditions of the proposed constructed utility system, 'As-Built' Record Document(s). These Record Documents shall be signed and sealed by a Professional Registered NC Land Surveyor for the entire Water Distribution Systems (Water, Domestic and Fire systems as indicated). 'As-Built' documents shall accurately document the field verified constructed system of the entire utility system including finish grade ground shots, all structures, ancillary structures, pipes, pipe inverts & rims, fittings, material & sizes etc including both vertical/horizontal identification of the system.

As-Built Document shall be submitted to the Owner/Owners Project Representative for review and Final Approval/Acceptance prior to request for Substantial Completion. If As-Built material is in conflict, represents deficiencies or unacceptable to the Owner and the proposed system design. The contractor shall make the field corrections necessary to bring the constructed system in compliance with the Bid Documents per Base Bid requirement. These modifications shall be completed within the time frame of the Base Contract/Substantial Completion schedule.

END OF SECTION 22 11 13

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SECTION 22 13 13

SANITARY SEWER DISTRIBUTION FACILITY

GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. City of Hickory Engineering Department Manual of Practice, current edition, section 600 Sewer System shall apply to the construction of all sewer mains, service lines, laterals, structures and related appurtenances.

1.2 SUMMARY

- A. This Section includes sanitary sewerage outside the building.
- B. Related Sections include the following:

DEFINITIONS

- PVC: Polyvinyl chloride plastic.
- B. DIP: Ductile Iron Pipe

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Non-pressure-Piping Pressure Ratings: At least equal to system test pressure.

SUBMITTALS

- A. Shop Drawings: Include plans, elevations, details, and attachments for the following:
 - 1. Manholes, frames and covers.
 - 2. Cleanouts
 - 3. Pipe, couplings, fittings, expansion joints etc.
- B. Product Data:

Product Certificates:

- D. Design Mix Reports: For cast-in-place concrete manhole.
- E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- F. Record Drawings: At Project Closeout of installed sewer service system according to Division 1 Section 'Closeout Procedures'.

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- G. As Built of the Sewer System Completion. See Section 22 13 13 Sanitary Sewer Distribution Facility, Part 3.14 for additional information.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

If applicable, locate existing structures and piping to be closed and abandoned.

Existing Utilities: Do not interrupt utilities serving any facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

- 1. Notify Architect not less than seven days in advance of proposed utility interruptions.
- 2. Do not proceed with utility interruptions without Architect's permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturers: Provide products by manufacturers listed on the drawings or approved equal.

PIPING MATERIALS

- A. Not all materials listed in this section will be used or allowed in the construction of this project.
- B. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.
- C. Use materials as specified by the governing authority having jurisdiction for the proposed work.

2.3 PIPES AND FITTINGS

PVC Sewer Pipe: ASTM D1785, Schedule 40 PVC, with plain ends for solvent-cemented joints

- B. PVC Sewer Pipe Fittings: ASTM D2466, Schedule 40 PVC, socket type.
- C. PVC Sewer Pipe and Fittings, NPS 15 (DN 375) and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

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- D. Ductile-Iron, Push-on-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.
- E. Ductile-Iron, Mechanical-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.

2.4 NONPRESSURE-TYPE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling; for joining underground non-pressure piping. Include ends of same sizes as piping to be joined and include corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Shielded, Flexible Couplings:
 - 1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Non-pressure-Type, Rigid Couplings:
 - 1. Description: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling; molded from ASTM C 1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.5 SPECIAL PIPE COUPLINGS AND FITTINGS

Couplings/Saddles: Couplings used to join various types of 12-inch and smaller pipe shall be elastomeric PVC sleeve couplings with stainless steel compression bands and stainless steel shear rings as manufactured by Mission Clay Products, Fernco, Logan Clay Products, or approved equal.

- B. Couplings for 12-inch and smaller pipe may also be elastomeric PVC with internally molded rigid fiberglass insert and stainless-steel bands as manufactured by DFW Plastics or approved equal. The coupling shall provide a water and/or gas tight connection.

2.6 CLEANOUTS

- A. Cast-Iron Cleanouts:
 - 1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

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2. Top-Loading Classification(s): Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

2.7 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 & 60" inches minimum unless otherwise indicated, see drawings.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 5-inch minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joints between sections shall be tongue and groove, and shall provide 0.10' nominal annular space, height shall be 4". Joint surfaces and tolerances shall be as per ASTM C-361. All joints shall be sealed with an "O" ring seal conforming to ASTM C 443, with an approved Butyl Rubber Sealant conforming to Federal Specification SS-S-210A, AASHTO M-198, for Type B-Butyl Rubber. Approved sealants are "Kent Seal No. 2, "Conseal CS-102 or CS-202", "Butyl-Nek", and "E-Z Stik", or approved equal.
8. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
9. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
10. Steps: Individual FRP steps, FRP ladder, or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, 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 36 inches.
11. Adjusting Rings: Interlocking HDPE rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
12. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as 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 "SANITARY SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

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C. Manhole-Cover Inserts:

1. Description; Manufactured, plastic form, of size to fit between manhole frame and cover and designed to prevent stormwater inflow. Include handle for removal and gasket for gastight sealing.
2. Type: Drainage with vent holes.

2.8 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

3. Cement: ASTM C 150, Type II.
4. Fine Aggregate: ASTM C 33, sand.
5. Coarse Aggregate: ASTM C 33, crushed gravel.
6. Water: Potable.

D. Portland Cement Design Mix: 4,000 psi minimum, with 0.50 maximum water-cementitious materials ratio.

2. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
3. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 400), deformed steel.

E. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4,000 psi minimum, with 0.50 maximum water-cementitious materials ratio. Include channels and benches in manholes.

2. 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.
3. Benches: Concrete, sloped to drain into channel.

F. Ballast and Pipe Supports: Portland cement design mix, 4,000 psi (20.7 MPa) minimum, with 0.58 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 400), deformed steel

2.9 IDENTIFICATION

Warning Tape to be installed with underground utilities, manufactured for marking and identifying underground utilities. Made of solid green film and continuously printed black letters 'Caution – Sewer Line Buried Below'.

- B. Arrange for Detectable Warning Tapes made of solid green film with metallic core and continuously printed black letters 'Caution – Sewer Line Buried Below'.

2.11 ACCESSORIES

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- A. Warning Tape: See Section 31 20 00 Earth Moving, Part 2.3 for additional information.
- B. Detectable Warning Tape: See Section 31 20 00 Earth Moving, Part 2.3 for additional information.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.2 IDENTIFICATION

- A. Install continuous plastic underground warning tape during back-filling of trench for underground sanitary sewer-service piping. Locate 8 to 12 inches above the proposed pipe, directly over piping.
- B. Install continuous plastic underground detectable warning tape during back-filling of trench for underground sanitary sewer-service piping. Locate 24-30 inches below finished grade, directly over piping.

3.3 PIPING APPLICATIONS

- A. General: Include watertight joints.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.
- C. Gravity-Flow Piping: Use the following:
 - 1. PVC Sewer Pipe and Fittings, ASTM D1785, Schedule 40 PVC, with plain ends for solvent-cemented joints and ASTM D2466, Schedule 40 PVC, socket type.
 - 2. PVC Sewer Pipe and Fittings, NPS 15 (DN 375) and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.
 - 3. Ductile-Iron, Push-on-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.

SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

- A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
 - 1. Use the following pipe couplings for nonpressure applications:
 - a. Sleeve type to join piping, of same size, or with small difference in OD.
 - b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.

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- c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
- 2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.
- B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.5 INSTALLATION, GENERAL

General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

- 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 according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.
- C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.

- 3. Install piping with 36-inch minimum cover, unless otherwise indicated.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated.
- B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation.
- C. Schedule 40 PVC Pipe and Fittings.
 - 1. Join PVC sewer piping according to ASTM D2321 and ASTM F891 for solvent-cemented joints.
- D. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.
 - 1. Install PE film, pipe encasement over ductile-iron sewer pipe and ductile-iron fittings according to ASTM A 674 or AWWA C105.
- E. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.
- F. Install with top surfaces of components, except piping, flush with finished surface.

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3.7 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, non-pressure, drainage piping according to the following:
 - 1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
 - 2. Join PVC gravity sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
 - 3. Join dissimilar pipe materials with non-pressure-type, flexible couplings.
- B. 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 non-pressure flexible couplings where required to join gravity-flow, non-pressure sewer piping unless otherwise indicated.
 - a. Shielded flexible couplings for pipes of same or slightly different OD.
 - b. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.8 MANHOLE INSTALLATION

- A. General: Install manholes complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Form continuous concrete channels and benches between inlets and outlet.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 1 inch above finished surface elsewhere unless otherwise indicated.
- E. Install manhole-cover inserts in frame and immediately below cover.

3.9 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

3.10 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.
- C. See details for concrete rings at cleanouts in lawn areas.

3.11 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.12 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

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- B. 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.
- C. 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.
- D. Make branch connections from side into existing piping, NPS 21 or larger, or to underground structures by cutting opening into existing unit 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 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.
 - 1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
 - 2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
- E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.13 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

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.

- 1. 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 Structures: Backfill to grade according to Division 2 Section "Earth Moving."
 - 1. Remove structure and close open ends of remaining piping.

3.14 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
 - 1. Place plug in end of incomplete piping at end of day and when work stops.
 - 2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. 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.

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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/structures.
 - d. Crushed, broken, cracked, or otherwise damaged piping.
 - e. Infiltration: Water leakage into piping.
 - f. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials and repeat inspections until defects are within allowances specified.
 4. Re-inspect and repeat the procedure until results are satisfactory.
- C. Test new sewer main piping and service lines systems, and parts of existing sewer main/service lines systems that have been altered, extended, or repaired, for leaks and defects. The Contractor shall make the construction site and pipe installation available to the Owner, City/County Engineer, Inspector or his representative at all times for inspections on the materials and construction.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to authorities having jurisdiction. Donated portions of line shall be inspected and tested by authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
 4. Submit separate reports for each test.
 5. If authorities having jurisdiction do not have published procedures, perform tests as follows:

Deflection Testing of PVC Pipe: not less than 30 days following completion of backfill, the pipe shall be tested for deflection with a 5% mandrel sized as defined in ASTM D-3034. The mandrel shall be pulled through each section of pipe from manhole to manhole. The mandrel must slide freely through the pipe with only a nominal hand force applied. No mechanical device shall be used in pulling the mandrel. Any pipe which refuses the mandrel shall be removed and replaced or re-rounded and the bedding shall be properly constructed as specified to prevent excessive deflection. Such sections shall be re-tested for deflection after completion of backfill.

- b. Sanitary Sewerage: Perform air test according to UNI-B-6.
 - 1 Test concrete piping according to ASTM C 924.
- c. Infiltration/Exfiltration of sewer system:
 6. The Contractor shall provide the equipment, materials and labor necessary to check the lines for infiltration or exfiltration before they are put in service. The Contractor shall ascertain where the leakage exists

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and repair the lines to the extent necessary to bring the infiltration or exfiltration to within acceptable limits.

7. Exfiltration tests shall be conducted on all gravity sewer lines, unless authorized otherwise by the Owner, City/County Engineer. All manholes shall be tested. The amount of exfiltration shall be measured by the inspector using methods specified by the City Engineer for the particular situation.
8. If the quantity of infiltration is more than the maximum allowable. The leaking condition/structures/pipe/joints shall be re-laid. If necessary, other remedial construction shall be performed at the expense of the contractor. All necessary sources of infiltration shall be repaired. The repaired sections of sewer shall be retested after repairs are completed to determine in compliance with the specifications.
9. The infiltration in the line shall be checked through a low-pressure exfiltration air test. The sanitary sewer pipe and lines shall be capable of reaching a constant pressure of 4-5 psig within the time specified in Table 1 and shall be capable of maintaining the pressure for the time limit specified in Table 2, see below.
10. The Owner shall require the Contractor to perform a visual inspection of the pipe complete in place by passing a video recording camera thru the pipe. Any visible defects, as specified in ASTM C- 700-78a or latest addendum, will be justification for rejection and the contractor shall repair the rejected section of pipe at his own expense. The Contractor is responsible to supply the equipment necessary for making the air pressure test and the video recording of the sewer line.
11. All tests shall be made in the presence of the Contractor, Owner, City/County Engineer. The costs for these tests shall be included in the Base Bid services of the contract.
12. All work necessary to bring the line into conformance with these specifications shall be performed by the contractor per Base Bid services.
13. Materials and construction methods called for in these specifications are of such nature as to insure maximum protection for the sewer from infiltration. The contractor shall be responsible for the sewer conforming to the above limits for a period of one year from the date of final acceptance.
14. See Table #1 and #2 below.

TABLE 1

TIME REQUIRED TO PRESSURIZE To 4-5 PSIG* TIME (IN MINUTES)

<u>PIPE</u>	<u>REACH OF LINE TESTED</u>						
<u>SIZE</u>	20'	100'	200'	300'	400'	500'	600'

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4"	6 sec.	0.5	1.0	1.5	1.9	2.4	3.0
6"	12 sec.	1.0	2.2	3.2	4.4	5.8	6.4
8"	23 sec.	1.9	3.8	6.0	7.6	9.6	11.6
10"	35 sec.	2.9	5.8	8.8	11.6	14.6	17.6
12"	50 sec.	4.2	8.4	12.6	16.8	21.2	25.6
15"	1.3 min.	6.6	13.2	19.8	26.4	35.0	39.6
18"	1.9	9.4	18.8	28.2	37.6	47.0	56.4
21"	2.5	12.6	25.2	37.8	50.4	63.0	75.6
24"	3.4	17.0	34.0	51.0	68.0	102.0	136.0

* This table is based on the compressor unit mounted on a Cherne Air-Loc Testing unit assuming 5 cfm capacity

TABLE 2

MINIMUM TEST TIME FOR VARIOUS PIPE SIZES

NOMINAL	T (TIME)	NOMINAL	T (TIME)
PIPE SIZE IN.MIN/100 FT.		PIPE SIZE	
IN.MIN/100 FT.			
3	0.2	21	3.0
4	0.3	24	3.6
6	0.7	27	4.2
8	1.2	30	4.8
10	1.5	33	5.4
12	1.8	36	6.0
15	2.1	39	6.6
18	2.4	42	7.3

The low pressure air test shall be performed as specified in latest revision of ASTM C 828 for VCP and ASTM C924 for RCP. If the line pressure drops more than 1 PSI during the required test time, then the section of pipe has failed the test.

1. Manholes: Perform hydraulic test according to ASTM C 969.
2. Leaks and loss in test pressure constitute defects that must be repaired.

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3. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.
4. As Built: Sealed survey required prior to acceptance indicating vertical and horizontal locations of the entire system sewer and septic system(s).
5. As Built; Contractor shall provide a field verify record documented conditions of the proposed constructed utility system, 'As-Built' Record Document(s). These Record Documents shall be signed and sealed by a Professional Registered NC Land Surveyor for the entire Sanitary Sewer Distribution System(s) (Sanitary Sewer systems as indicated). 'As-Built' documents shall accurately document the field verified constructed system of the entire utility system including finish grade ground shots, all structures, ancillary structures, pipes, pipe inverts & rims, fittings, material & sizes etc including both vertical/horizontal identification of the system.
6. As-Built Document shall be submitted to the Owner/Owners Project Representative for review and Final Approval/Acceptance prior to request for Substantial Completion. If As-Built material is in conflict, represents deficiencies or unacceptable to the Owner and the proposed system design. The contractor shall make the field corrections necessary to bring the constructed system in compliance with the Bid Documents per Base Bid requirement. These modifications shall be completed within the time frame of the Base Contract/Substantial Completion schedule.

END OF SECTION 22 13 13

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SECTION 31 10 00 - 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. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Temporary erosion- and sedimentation-control measures.

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for temporary utility services, construction and support facilities, security and protection facilities, and temporary erosion- and sedimentation-control measures.
2. Division 01 Section "Execution" for field engineering and surveying.

1.3 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically 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 and is the zone where plant roots grow.
- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is 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 more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.
- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

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- F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.
- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and other 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.

1.5 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 videotape.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

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

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Salvagable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Utility Locator Service: Notify Call Before You Dig for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- E. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.

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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.
- F. Do not direct vehicle or equipment exhaust towards protection zones.
- G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- H. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "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. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag each tree trunk at 54 inches above the ground.
- C. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

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- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. General: Protect trees and plants remaining on-site according to requirements in Division 01 Section "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
 - 3. Remove light poles as indicated on plans.
 - 4. Relocate underground electric as indicated on plans.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Grind down stumps and remove roots, obstructions, to whatever depths are encountered.
 - 3. Dispose of all clearing debris in a legally approved off-site landfill.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

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3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
 - 1. Limit height of topsoil stockpiles to 72 inches.
 - 2. Do not stockpile topsoil within protection zones.
 - 3. Dispose of surplus topsoil off site in a legally approved waste area. Surplus topsoil is that which can not be reused on site.
 - 4. Temporarily stockpile/Salvage surplus topsoil to allow for re-spreading deeper topsoil.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.
- C. Remove existing flag pole and granite monument and store. Owner will provide direction on relocation areas within park for Contractor to re-install.

3.8 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 non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

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SECTION 31 20 00 - 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. This Section includes the following:

1. Preparing subgrades for slabs-on-grade, walks, pavements and lawn and grass areas.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for slabs-on-grade.
4. Subsurface drainage backfill for walls and trenches.
5. Excavating and backfilling for utility trenches.

- B. Related Sections include the following:

1. Division 01 Section "Qualification of Subsurface Exploration" to explore the existing site's subsurface conditions, examine represented soil samples, and provide construction recommendation.
2. Division 01 Section "Unit Prices" for unit-price rock excavation and authorized additional excavation provisions.
3. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
4. Division 31 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
5. Division 31 Section "Dewatering" for lowering and disposing of ground water during construction.
6. Division 31 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
7. Division 32 Section "Turf and Grasses" for finish grading, including preparing and placing topsoil and planting soil for lawns.
8. Division 33 Section "Subdrainage" for drainage of foundations, slabs-on-grade, and walls.

1.3 UNIT PRICES

- A. Unit prices for earthwork are included in Division 01 Section "Unit Prices."
- B. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.

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1. 12 inches (300 mm) outside of concrete forms at footings.
2. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
3. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
4. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
5. 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe.

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
 2. Final Backfill: Backfill placed over initial backfill to fill a trench includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
- B. Base Course: Course placed between the subbase course and hot-mix asphalt paving includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
- C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
- E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices and includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
 2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.

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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 includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
 - H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
 - I. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
 - J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.
 - K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
 - L. Rock: Rock material in beds, ledges, un-stratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
 1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp (103-kW) flywheel power with bucket-curling force of not less than 28,090 lbf (125 kN) and stick-crowd force of not less than 18,650 lbf (83 kN); measured according to SAE J-1179.
 2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp (157-kW) flywheel power and developing a minimum of 48,510-lbf (216-kN) breakout force with a general-purpose bare bucket; measured according to SAE J-732.
- 1.5 SUBMITTALS
- A. Product Data: For the following:
 1. Each type of plastic warning tape.
 2. Geotextile.
 - B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.

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2. Laboratory compaction curve according to ASTM D 698 for each on-site and borrow soil material proposed for fill and backfill.
- C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- B. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.
 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Architect's written permission.
 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Contractor shall only use approved truck routes for hauling of equipment, select material for bedding or backfill, excess or spoil dirt for disposal, etc. Approval for hauling shall be obtained from appropriate governing agency (NCDOT, local regulatory agency, private property owner, etc.) prior to start of work.
- B. Where necessary for the Contractor to remove and/or purchase fill material from a borrow site, said site shall comply with requirements for a permitted quarry operation as set by NCDENR.
- C. Soil stockpiles shall be protected to prevent erosion in accordance with NCDENR requirements.
- D. No stockpiling of backfill, spoil, aggregate, or other construction material or debris shall be permitted on a street open to vehicular traffic without an approved plan for signing, barricading, and detouring as necessary.
- E. The Contractor shall immediately notify the Architect and cease related excavation activities upon the discovery of abandoned graves, wells, fuel tanks, and hazardous or non-hazardous waste disposal sites.

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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 2 inches (50 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- F. 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 (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- G. 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 (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.
- J. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.
- K. 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

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than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
3. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
4. Tear Strength: 56 lbf (250 N); ASTM D 4533.
5. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
6. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D 4751.
7. Permittivity: 0.2 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 247 lbf (1100 N); ASTM D 4632.
3. Sewn Seam Strength: 222 lbf (990 N); ASTM D 4632.
4. Tear Strength: 90 lbf (400 N); ASTM D 4533.
5. Puncture Strength: 90 lbf (400 N); ASTM D 4833.
6. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:
- B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) 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 (750 mm) 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.

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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 31 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing," during earthwork operations.
- D. Provide subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- E. Contractor shall provide a minimum of one competent person at each construction site where excavations are in progress. A competent person shall mean one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorized to take prompt measures to eliminate such conditions.
- F. All surface encumbrances, fall hazards, and load overburdens such as stored materials, soil stockpiles, co-workers or on-lookers, pump, loaders, other equipment, etc. shall be removed or relocated away from excavations a sufficient distance to prevent hazards from falling objects and trench wall cave-in or collapse.
- G. Contractor shall provide sufficient access and egress for all employees. A stairway, ladder, ramp, or other safe means of access and egress shall be located in trench excavations that are four (4') feet or more in depth so as to require no more than twenty-five (25') feet of lateral travel for employees.
- H. Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with 1926.652 (b), Design of Sloping and Benching Systems, and Other Protective Systems except where excavations are found by a competent person to be entirely in stable rock or in excavations which are less than five (5') feet in depth and present no indication of potential cave-in.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

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1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
3. The dewatering system is whatever system is needed to draw down and maintain ground water below elevations and line specified on the drawings. Measures include trenches, pumps, well points, sheet piling, and whatever equipment and maintenance thereof to prevent ground water from rising in the project area.
4. The Contractor shall at all times provide and maintain ample means and equipment with which to remove and properly dispose of any and all water entering the excavation.
5. No water shall be allowed to rise around the pipe in unbackfilled trenches, nor shall water be allowed to rise over masonry until the concrete or mortar has set for minimum of twenty-four (24) hours. All water pumped or drained from the work area shall be disposed of in such a manner as to prevent siltation and erosion to adjacent property, streets, drainage ditches, natural water features, or storm drainage.

3.3 EXPLOSIVES

- A. Explosives: **Do not use explosives.**

3.4 EXCAVATION, GENERAL

- A. Classified Excavation: Excavate to subgrade elevations and sections and as illustrated on the drawings regardless of the character of surface and subsurface conditions encountered, except for rock or obstructions that cannot be broken up by rippers, power shovel, or normal job equipment used for general excavation. See Section 1.4 herein for rock definition. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with satisfactory and unsatisfactory soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches (600 mm) outside of concrete forms other than at footings.
 - b. 12 inches (300 mm) outside of concrete forms at footings.
 - c. 6 inches (150 mm) 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 (150 mm) beneath bottom of concrete slabs on grade.

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- f. 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe.
- B. Excavation shall include stockpiling of materials suitable for backfill.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). 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. 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 (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

3.6 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 (300 mm) higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: 12 inches (300 mm) 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. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 - 3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

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1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
2. The trench bottom shall be shaped to conform to the exterior of the pipe with bell holes at each joint to provide full support along the entire length of pipe with soil and/or bedding as shown on the Typical Cross-Section on the drawings.
3. If during the course of construction, the trench should be inadvertently over-excavated, the Contractor shall fill the trench to grade with approved material and compact to a minimum AASHTO T99 density of Ninety (90%) percent.
4. Where an unstable trench bottom condition is encountered, the Contractor shall stabilize the trench bottom by excavating and installing satisfactory fill material and compacting to a minimum AASHTO T99 density of Ninety (90%) percent. Do not excavate unstable trench bottom until it has been classified and cross-sectioned by Architect. The Contract Sum will be adjusted for unsatisfactory soil excavation (below trench bottom shown on typical section) according to unit prices included in the contract documents. Changes in the contract time may be authorized for excavation.

3.7 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.
 1. The Contract Sum will be adjusted for unsatisfactory soil excavation (below subgrade) according to unit prices included in the Contract Documents. Changes in contract time may be authorized for excavation.
- C. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
 1. Areas of excessive pumping in fill areas placed by Contractor will not be considered for additional excavation.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.8 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.
 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

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1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 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 and 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.

3.11 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- D. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the utility pipe or conduit.
 1. Carefully hand compact initial backfill in six inch layers under pipe haunches and compact to AASHTO T99 density of ninety (90%) percent evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit.
 2. Whenever shoring, sheeting, and/or bracing are used, trench protection shall be left in place at least until the pipe has been laid and backfilled to a point two (2') feet above the pipe. The removal of sheeting shall be done in such a manner as to minimize the loss of friction between the backfill and trench walls. Sheeting shall not in any way be braced against the pipe. Sheeting may be trimmed and left in place only with prior written approval from the Architect.
 3. Whenever a movable steel box is used as a shield system, care shall be taken to protect the integrity of the pipe bedding and to prevent the pipe from moving when the steel box is moved. The pipe must be secured to prevent longitudinal movement. If steel trench boxes are to stacked for use in deeper trenches, each box section shall be designed and approved for such installations by the manufacturer, and the sections shall be rigidly attached such that all sections shall move and function as one unit.

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- E. Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- F. Place and compact final backfill of satisfactory soil to final subgrade elevation. Machine place in uniform loose lifts of six to eight inch layers and compacted to the density as specified on drawings.
- G. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.
- H. All trenches and similar excavations will be filled, compacted, and permanently resurfaced within 72 hours of completing the associated construction work, unless exception is made by Architect.
- I. Where trench excavation crosses surface structures such as sidewalks, curbs and gutters, etc, the Contractor shall remove joint-to-joint sidewalk and/or curb and gutter and replace in kind. Contractor shall not excavate under surface structures without removing and replacing the structure.

3.12 SOIL FILL

- A. Preparation: Remove vegetation, construction materials, lumps, clods or rocks larger than six (6") inches in their greatest diameter with no more than 15% of the lumps or rocks greater than two (2") inches in their greatest diameter, frozen or excessively wet material, debris or other objectionable materials which would hinder placement, compaction, and consolidation of the backfill material, topsoil, debris, unsuitable soil materials, obstructions, and deleterious materials from ground surface before placing fills. Stock pile topsoil and re-spread over non-structural areas to finish grades shown on drawings.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material. Unsatisfactory soil may be useable if approved by Architect.
 - 2. Under building slabs and parking areas, use engineered fill.
 - 3. Under footings and foundations, use engineered fill.
- D. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 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.

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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.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill 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. Under structures, building slabs, steps, and pavements, scarify and recompact top 24 inches of existing subgrade and each layer of backfill or fill soil material at 98 percent.
 2. Under walkways areas, scarify and recompact top 12 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent, SPD.
 3. Under athletic field, lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) 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 95 percent.

3.15 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.
 3. Tops and bottoms of all slopes: Round tops and bottoms of slopes and drainage swales. Adjust and warp slopes, at intersections of cuts, and fills, to flow into each other or into the existing natural ground surface without noticeable break. Cuts and fills shall have a maximum slope of 3' horizontally to 1' vertically, unless otherwise shown on the contract drawings. The finished surface of all lawn areas after planting shall not be less than ½ inch below the finished grade of all walks or other surface areas.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
 2. Walks: Plus or minus 1/2 inch (13 mm).
 3. Pavements: Plus or minus 1/2 inch (13 mm).
 4. Any deviation in excess of the above amount shall be corrected by the Contractor by loosening, adding or removing material, reshaping, and compacting as directed by the Architect at no additional cost.

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- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.
- D. Grading of all Lawn Areas – Non-athletic: All areas receiving a natural grass surface shall have an additional smoothness requirement. Finished grade shall have no high or low spot greater than ¼ inch every ten feet.
 - 1. Any deviation in excess of the above amount shall be corrected by the Contractor by loosening, adding or removing material, re-shaping, and compacting as directed by the Architect for no additional cost.
 - 2. Contractor is responsible to perform finish grading for the sub-grade and soil conditioner material for the natural grass surface.

3.16 SUBSURFACE DRAINAGE

- A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch (150-mm) course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches (300 mm) of filter material, placed in compacted layers 6 inches (150 mm) thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).
 - 1. Compact each filter material layer to 90 percent of maximum dry unit weight according to ASTM D 698.
 - 2. See drawings for typical cross section and subsurface drain locations.
- B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final subgrade, in compacted layers 6 inches (150 mm) thick. Overlay drainage backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).
 - 1. Compact each filter material layer to 90 percent of maximum dry unit weight according to ASTM D 698].
 - 2. Place and compact impervious fill over drainage backfill in 6-inch- (150-mm-) thick compacted layers to final subgrade.
 - 3. See drawings for typical cross section.

3.17 SUBBASE AND BASE COURSES

- A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase 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, where and if indicated.
 - 2. Shape subbase and base course to required crown elevations and cross-slope grades.
 - 3. Place subbase and base course 6 inches (150 mm) or less in compacted thickness in a single layer.

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4. Place subbase and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
5. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 698.

3.18 DRAINAGE COURSE

- 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 (150 mm) or less in compacted thickness in a single layer.
 3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) 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 D 698.

3.19 FIELD QUALITY CONTROL

- A. Testing Agency: The Owner reserves the right to 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. 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.

3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

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- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 20 00

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SECTION 31 20 20 –EROSION CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including the General and Supplementary General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes soil erosion and sedimentation control shall be provided by the Contractor for all areas of the site that are graded or disturbed by any construction operations and elsewhere as indicated on Drawings or specified herein. Erosion control shall be as specified herein and as may be required by actual conditions and governing authorities.
- B. The Contractor shall have full responsibility for the construction and maintenance of erosion control and sedimentation control facilities as shown on the Drawings and as specified herein.
- C. The Contractor shall provide temporary ground cover, within the schedule specified in Erosion Control Plans. Provide permanent ground cover based on the planting season specified in Section 32 92 00 “Turf and Grasses” or as required by regulatory inspectors.
- D. All erosion control measures shall be incorporated into the work at the earliest practicable time. Temporary erosion control measures shall be coordinated with post control measures and all other work on the project to assure economical, effective, and continuous erosion control throughout the construction and post construction period to minimize siltation of streams, creeks, lakes, and other water courses or impoundments; storm sewer systems either existing or proposed; and other properties either public or private.
- E. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Site Clearing
 - 2. Earthwork
 - 3. Drainage
 - 4. Lawns and Grasses
- F. Product Handling
 - 1. Deliver seed, fertilizer, and other packaged materials in unopened original packages with labels legible and intact. Seed packages shall bear a guaranteed analysis by a recognized authority.
 - 2. On-site storage of materials shall be kept to a minimum. Wet or damaged seed or other material shall be removed from the project site immediately.
- G. Dust Control:

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1. Contractor shall implement dust control measures as necessary to limit dust in travel areas and on adjacent properties either directly or indirectly related to construction activities of this Contract.

At a minimum, dust control measures shall be performed daily during all grading, excavation, and/or hauling operations.

- H. The Contractor shall be responsible for erosion control measures for all areas of disturbance directly or indirectly resulting from construction activities. Where said measures are required outside of the construction of right-of-way, easements, or limits due to operations such as hauling, equipment or material storage, borrow pit operations, waste disposal, etc., the Contractor shall be responsible for developing and implementing an erosion and sedimentation control plan for these areas. Where off site disturbances require permits for sedimentation and erosion control or quarry operations, the Contractor shall obtain the necessary permit(s) from the NC Division of Environment, Health, and Natural Resources, Division of Land Quality.
- I. The Contractor shall provide all materials, labor, equipment, tools, etc., and perform all required work and services necessary for an incidental to Sedimentation and Erosion Control as shown on the Plans or covered in these Specifications.

1.3 SUBMITTAL

- A. The Owner has applied for and obtained a land disturbing activity permit for the project from the governing body. The Contractor shall furnish the following supplemental information to the Owner: (1) Erosion Control officer information and (2) construction activity schedule showing starting and completion dates for all land development activities. It is the Contractor's responsibility to comply with all requirements, conditions, and limitations of the land-disturbing activity permit issued by the regulatory agency.

1.4 QUALITY ASSURANCE

- A. Regulations: Contractor shall comply with industry standards and applicable Laws and Regulations of authorities having jurisdiction, including but not limited to:
 1. Environmental Protection Regulations
 2. City of Hickory, NC
 3. NCDEQ, Division of Land Quality.

PART 2 – PRODUCTS

2.1 MATERIALS:

- A. Lime:
 1. Ground Dolomitic limestone not less than 85% total carbonates and magnesium, ground so that 50% passes 100 mesh sieve and 90% 20 mesh sieve. Coarser material

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will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing No. 100 mesh sieve.

B. Commercial Fertilizer:

1. A complete plant food containing nitrogen, phosphoric acid and potash in percentages as recommended by the State Department of Agriculture based on analysis of topsoil and soil required herein.
2. Conforming to applicable State fertilizer laws; with availability of plant nutrients conforming to standards of A.O.A.C. uniform in composition, dry, free flowing.

C. Superphosphate:

1. Granular, dry, free flowing normal superphosphate (18-20% P.O.); deliver in original bags.

D. Seed:

1. Fresh seed guaranteed 95% pure with a minimum germination rate of 85% within one year of test. Variety and seeding schedule is specified on the plans.
2. P.L.S. (Purity x Germination)/100
3. Tolerances shall be those tabulated in USDA Bulletin No. 480.
4. Variety of grass for temporary grassing shall conform to requirements shown on the plans.

E. Mulch:

Threshed straw of oats, wheat, or rye; free from seed or noxious weeds; or clean hay.

F. Matting:

1. "Hold Gro" as manufactured by Gulf States Paper Corporation, North American Green, ACF Environmental or equal, or heavy, twisted jute mesh. Opening between strands shall be approximately ¾" square.

G. Wire Staples:

1. 16-gauge steel wire, with minimum of 3" top and 4" long legs.

H. Gravel for Stone Filters:

1. Crushed stone so that all stone will pass a 1-1/2" mesh screen and be retained on ¾" mesh screen.

I. Filter Fabric:

1. Meet or exceed the minimum requirements of NCDOT SSRS Section 1056 for type 3 fabrics in either class A or B.

J. Rip Rap:

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1. Rip rap material shall meet the requirements of Section 1042 of the NCDOT SSRS and filter fabric underlayment shall meet the requirements of Section 1056 of the NCDOT SSRS for type 2 fabric.

PART 3 – EXECUTION

3.1 GENERAL:

A. Existing Structures and Facilities:

1. Existing structures, facilities, and water courses shall be protected from sedimentation.
2. The Contractor shall be responsible for the construction of necessary measures, and all costs shall be at the expense of the Contractor.
3. Items to be protected from sedimentation deposits shall include, but are not limited to, all down stream property, natural waterways, streams, lakes and ponds, reservoirs, ground surfaces, catch basins, drainage ditches, road gutters, and natural buffer zones.
4. Control measures such as the erection of silt fences, barriers, dams, or other structures shall begin prior to any land disturbing activity. Additional measures shall be constructed as required during the construction.
5. All facilities installed shall be maintained continuously during construction until the disturbed areas are stabilized and until Final Acceptance.

3.2 PROTECTIVE MEASURES:

- A.** All construction shall be in accordance with the rules and regulations of the North Carolina Department of Environment, Health, and Natural Resources, Division of Land Resources and the Sedimentation and Erosion Control Ordinance and local ordinances. If discrepancies should occur between above regulations, the more restrictive requirement shall apply.
- B.** The following measures are listed as guide for the protection of existing structures and facilities, and shall be included in the Contractor's expense where applicable. Design and construction of the measures shall be in accordance with all applicable laws, codes, ordinances, rules, and regulations.
- C. Silt Check Fence:**
1. Filter fabric fence shall be a minimum of 32" in width and shall have a minimum of 6 line wires with 12" stay spaces.
 2. Woven filter fabric shall be used where silt fence is to remain for a period of more than 30 days.
 3. Steel posts be 5'-0" in height and be of the self-fastener angle steel type.
 4. Prefabricated silt fence is not allowed.
 5. Wash Stone shall be used to bury skirt when silt fence is used adjacent to a channel, creek, or pond.
 6. Turn silt fence up slope at ends.
 7. Fabric use with wire mesh may use 8' center posts.

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- D. Berms and Diversion Ditches: These shall be graded channels with a supporting ridge on the lower side constructed across a sloping land surface. Diversion ditches and berms shall be planted in vegetative cover as soon as completed.
- E. Mulching shall be used to prevent erosion and to hold soil and seed in place during the establishment of vegetation. Matting shall be used also where seeding may be easily eroded or disturbed.
- F. Matting: Matting shall be used for temporary stabilization during the establishment of seeded cover on areas such as grassed ditches, channels, long slopes, and steep banks.
- G. Build Berm, Pits, and Gravel Filter as shown on Drawings. Maintain as long as possible during construction to keep erosion and sedimentation to a minimum. When it is necessary to remove berm, pits, and gravel, return area to required profiles and condition.
- H. Temporary Drainage Inlet Protection: provide temporary drainage inlet protection where indicated on Drawings and as approved by the Architect.
- I. Other Measures: Other methods of protecting existing structures and facilities, such as vegetative filter strips, diversions, rip-rap, baffle boards, and ditch checks used for reduction of sediment movement and erosion, may be used at the option of the Contractor when approved by the appropriate State or local authorities.

3.3 STABILIZATION:

- A. Permanently protect stabilized areas prior to the removal of protective devices.
- B. After the final establishment of permanent stabilization, remove temporary sediment control measures. Re-spread accumulated sediments as specified.
- C. Permanently stabilize all areas disturbed by the removal and resspreading operations immediately.

3.4 TEMPORARY SEEDING:

- A. Variety of seed, rate of application, and time for use of specific variety shall comply with requirements of specifications in construction documents.
- B. Prepare soil by light disking to establish approximate permanent grade.
- C. Remove roots, debris, and stones. After rough grading has been completed, and before topsoil is spread, apply soil conditioning materials as follows:

<u>Material</u>	<u>Application Rate</u> (lbs. Per 1000 sq. ft.)
Lime 100	(Apply from October through May)
Fertilizer	20 (10-10-10)
Superphosphate	15

- D. Thoroughly scarify ground to a depth of 6". Mix materials thoroughly with tiller in 2 directions at right angles.

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- E. Where requested, apply topsoil. Rake topsoil to a uniform grade so that all areas will drain properly. Compact lightly with a cultipacker before distributing grass seed.
- F. Sow seed evenly with a mechanical spreader at the rate required for the specific variety. Roll with a cultipacker to cover seed, and water with a fine spray. Method of seeding and rate may be varied at discretion of Contractor on his own responsibility to establish a smooth, uniformly grassed area.

3.5 MULCHING AND MATTING:

- A. Apply mulch or matting to retain soil and grass
- B. Mulch areas with slope less than 20% by spreading a light cover of mulch over seeded area at the rate of not less than 85 lbs. per 1000 sq. ft.
- C. On slopes greater than 20%, mulch with matting. Pin matting to the ground with wire staples at 5' intervals immediately after seeding.

3.6 DUST CONTROL

- A. The Contractor shall control dust throughout the life of the project within the project area and at all other areas affected by the construction. Potential sites requiring Dust Control shall include but not be specifically limited to: paved and unpaved roads, haul roads, access roads, disposal sites, borrow pits, and material and equipment storage sites.
- B. Contractor shall implement necessary measures for dust control due to grading, clearing, excavation, hauling, or movement of vehicular traffic through construction sites. Necessary measures shall include but not be specifically limited to:
 - 1. Wetting down disturbed earth surfaces and/or adjacent pavements.
 - 2. Removing accumulations of dirt from paved areas by hand or mechanical means.
 - 3. Washing streets at end of work day. (Prior to washing of streets, adequate silt barriers and sediment basins or traps shall be installed at all discharge points to eliminate transport of sediment to storm sewer systems or natural watercourses).

3.7 MAINTENANCE OF MEASURES

- A. Erosion control measures shall be inspected daily during active construction. During times when construction is not on-going, erosion control measures shall be inspected weekly and after each rainfall event measuring ½" or more at a time.

3.8 REPAIR AND REPLACEMENT

- A. Needed repairs shall be made immediately upon discovery or upon notification by Engineer or his appointed field representative.

3.9 REMOVAL OF MEASURES

- A. After site is stabilized and upon approval by NCDENR, remove all temporary measures and install permanent vegetation on any additional disturbed or failed areas.

END OF SECTION 31 20 20

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SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes construction dewatering.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving" for excavating, backfilling, site grading, and for site utilities.

1.3 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
 - 1. Delegated Design: Design dewatering system, using performance requirements and design criteria indicated.
 - 2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
 - 3. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 5. Remove dewatering system when no longer required for construction.

1.4 SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in dewatering work.

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- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of utility.
 - 2. Do not proceed with interruption of utility without Architect's written permission.

PART 2 - PRODUCTS (Not Used)

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 dewatering operations.
 - 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
 - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.
- D. Monitor dewatering systems continuously.
- E. Promptly repair damages to adjacent facilities caused by dewatering.
- F. Protect and maintain temporary erosion and sedimentation controls, which are specified in Division 1 Section "Temporary Facilities and Controls" and Division 31 Section "Site Clearing" during dewatering operations.

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3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
 - 1. Space well points or wells at intervals required to provide sufficient dewatering.
 - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
- D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 - 1. Maintain piezometric water level a minimum of 24 inches (600 mm) below surface of excavation.
- E. 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. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- F. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.
 - 1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches (900 mm) below overlying construction.
- G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

END OF SECTION 31 23 19

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SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Hot-mix asphalt patching.
 - 2. Hot-mix asphalt paving.
 - 3. Pavement-marking paint.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
 - 2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

1.3 DEFINITION

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
 - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- B. Qualification Data: For qualified manufacturer and Installer.
- C. Material Certificates: For each paving material, from manufacturer.
- D. Material Test Reports: For each paving material.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by North Carolina Department of Transportation (NCDOT). Plants used for the preparation of bituminous mixtures shall conform to all requirements of NCDOT Standard Specifications for

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Roads and Structures (SSRS) Subarticle 610-5(B). In addition, batch mixing plants shall also conform to Subarticle 610-5(C), continuous mixing plants shall also conform to Subarticle 610-5(D), and drum mixing plants shall also conform to Subarticle 610-5(E).

- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of standard specifications of NCDOT for asphalt paving work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- D. 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 condition of subgrade and preparatory work.
 - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.
- C. Transportation of bituminous mixture from the mixing plant to the site shall be in trucks having tight, clean, smooth, lightly oiled beds. The Engineer may require each load to be covered with canvas or other suitable material of ample size to protect the mix from the weather and prevent the loss of heat. Deliveries shall be made such that spreading and rolling of all mixture prepared during a day's run can be completed during daylight, unless artificial light satisfactory to the Engineer is provided. The mixture shall be delivered to the area to be paved in such a manner that the temperature at the time of dumping into the spreader will not be less than hereinafter specified.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

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1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
 4. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
 5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.
 6. Or as allowed by NCDOT.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for oil-based materials, and not exceeding 95 deg F (35 deg C).

1.8 PROTECTION OF THE WORK

- A. Protection from damage: The Contractor shall adequately and fully protect all parts of the work against damage until completed and accepted by the Owner. Damages shall be properly repaired by the Contractor at no additional expense to the Owner.
- B. Temporary Barricades: Throughout the duration of the Contract, the Contractor shall provide temporary barricades, conforming with the latest edition of U.S. Department of Transportation's "Manual on Uniform Traffic Control Devices for Streets and Highways," properly lighted, to keep traffic off the current portion of the work.
- C. Protection of adjacent surfaces: The Contractor shall protect exposed surfaces adjacent to the work from physical damage resulting from construction activities, and from becoming stained during application of paving materials. The Contractor shall clean, repair, or replace, as required, surfaces damaged during the course of the work at no additional expense to the Owner.
- D. Protection from Graffiti: Newly paved roads, streets, curbs, or sidewalks shall be protected AND guarded from graffiti from passersby until the asphalt has sufficiently cured to resist such molestation. Failure to prevent graffiti, or other such vandalism, shall result in the new asphalt having to be removed and replaced. This requirement shall mandate the Contractor to take the necessary steps in preventing such incidents including, but not limited, to guarding the project after normal working hours.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

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- C. Fine Aggregate: ASTM D 1073 or 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.
- D. Mineral Filler: ASTM D 242 or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320 in accordance with NCDOT section 1020.
- B. Asphalt Cement: ASTM D 3381 for viscosity-graded material and ASTM D 946 for penetration-graded material.
- C. 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.
- D. Water: Potable.
- E. Undersealing Asphalt: ASTM D 3141, pumping consistency.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA, USDA, and NC Department of Agriculture. Provide in granular, liquid, or wettable powder form.
 - 1. Use of herbicide shall be limited to the roadway subgrade and stone base.
- B. Sand: AASHTO M 29, Grade Nos. 2 or 3.
- C. Joint Sealant: ASTM D 6690 Type III, hot-applied, single-component, polymer-modified bituminous sealant.
- D. Pavement-Marking Paint (Outside public right-of-way): Latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952. All pavement marking shall be in accordance with the latest edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways," U.S. DOT.
 - 1. Color: White – NCDOT color 17886.
 - 2. Color: Yellow – NCDOT color 13538.
- E. Pavement-Marking Paint (Inside public right-of-way): Thermo-plastic, comply with NCDOT Standards Section 1205.
 - 1. Color: White – NCDOT color 17886.
 - 2. Color: Yellow – NCDOT color 13538.

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2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Base, surface course or mix as indicated on drawings.

2.5 EQUIPMENT

- A. Paver
 - 1. Paver shall be a self-contained, self-propelled paver specifically designed for uniform placement of bituminous mixtures with fully activated screed plate. The screed plate shall be of adequate length to spread and finish the full uniform travel lane width being placed and also equipped to be pre-heated for the full length of the screed when necessary.
- B. Self-Propelled Tandem Steel Wheeled Roller
 - 1. Tandem steel wheeled roller shall be self-propelled, weigh not less than ten (10) tons at any time, and have a minimum weight of two hundred (200) pounds per inch width of wheel weight. The wheels shall be equipped with adjustable scrapers and sprayers.
- C. Self-Propelled Pneumatic Tired Roller
 - 1. Pneumatic tired rollers shall be self-propelled, weigh not less than eight (8) tons at any time, have not less than seven (7) pneumatic tires with equal tire pressure of sixty to ninety (60-90) PSI, and have a minimum weight of two hundred (200) pounds per inch width of wheel weight. The wheels shall be equipped with adjustable scrapers and sprayers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h), or 300 feet per minute.

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2. Proof roll subgrade and base course with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes). Truck shall be sufficiently loaded with ballast to provide a minimum weight of (30) tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.3 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 (25 mm) in existing pavements.
 1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).
 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 (6 mm) 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 (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.4 MANHOLE AND VALVE BOX ADJUSTMENT

- A. All existing manholes and valve boxes shall be adjusted to grade in accordance with this Section prior to placement of pavement surface course.
- B. Contractor shall protect and reuse existing castings where possible. It shall be the Contractor's responsibility to show prior damage of castings to Architect at earliest possible opportunity.

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Castings damaged during or due to construction activities shall be the responsibility of the Contractor, and said castings shall be replaced by the Contractor at no cost to the Owner.

- C. Roadway boxes for water valves, gas valves, water blowoffs, sewer cleanouts, monitoring wells, locator wires, etc., shall be adjusted using telescopic adjustment feature of box where possible. An adequate area around the box (2' by 2' min.) shall be removed for adjustment of box and backfilling. Where adjustment with telescopic feature is not adequate, the box shall be completely removed and reset to proposed grade using concrete setting blocks and #57 stone to subgrade elevation. Excavation for box adjustment shall be backfilled with #57 stone or CABC to a maximum of six (6") inch area below the surface course shall be filled with Class A portland cement concrete or Type B25.0B binder.
- D. Masonry manholes shall be removed to a sufficient depth to provide for adjustment, and the adjustment shall be made with masonry brick and mortar with a ½" min. parge coat of mortar placed over the masonry inside and out. Masonry steps shall be maintained consistent with existing spacing. Excavation for manhole adjustment shall be backfilled with #57 stone or CABC to a maximum of (6") inches below the bottom of the surface course. The area below the surface course shall be filled with Class A portland cement concrete or Type B25.0B binder.
- E. Precast manholes may be adjusted with masonry brick, mortar, and parge coat as with masonry manholes or Contractor may opt for replacement of existing cone riser with an eccentric cone riser or addition of an interlocking precast reinforced concrete grade ring. Cone risers and adjusting grade rings shall be manufactured in accordance with ASTM C-478, latest edition. Excavation for manhole adjustment shall be backfilled with #57 stone or CABC to a maximum of six (6") inches below the bottom of the surface course. The area below the surface course shall be filled with Class A portland cement concrete or Type B25.0B binder.

3.5 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
 - 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
 - 3. All areas where pavement courses will be placed against castings or gutter edges shall also be coated with tack.

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3.6 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated on drawings.
 - 2. Place hot-mix asphalt surface course in single lift unless indicated otherwise on drawings.
 - 3. Spread mix at minimum temperature of 250 deg F (121 deg C).
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
 - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
 - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
 - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 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.

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1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct lay down 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. Comply with NCDOT range of acceptable densities per Superpave Gyratory Compactor test method.
- 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.

3.9 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 1. Base Course: Plus or minus 1/2 inch (13 mm).
 2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
 1. Base Course: 1/4 inch (6 mm).
 2. Surface Course: 1/8 inch (3 mm).
 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

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- B. Allow paving to age for 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 (0.4 mm).

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections. Cost will be billed to the construction testing allowance. See bid form. Notify Architect two days in advance of testing.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- 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 according to ASTM D 979 or AASHTO T 168.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- E. 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.
- G. Smoothness Test
 - 1. Location of smoothness testing shall be at random locations specified by the Architect. Contractor shall be responsible for supplying two competent workers to assist Architect or his appointed representative in testing.
 - 2. The top surface of the in place and compacted pavement shall not show any deviations in excess of one-quarter (1/4") inch when tested with a ten (10') foot straight-edge applied with and at right angle to the centerline of the roadway.

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3. Any deviation in excess of the above amount shall be corrected by the Contractor by heating, shaping, milling, resurfacing, or removal and replacement as necessary at no additional expense to the Owner.

3.12 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
 1. Do not allow milled materials to accumulate on-site.

END OF SECTION 32 12 16

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SECTION 32 13 13 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
- B. Related Sections include the following:
 - 1. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
 - 2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Qualification Data: For testing agency.
- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

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- E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 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.
- F. Field quality-control test reports.
- G. Minutes of pre-installation conference.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- E. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Obtain Architect's approval of mockups before starting construction.
 - 4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
 - 5. Demolish and remove approved mockups from the site when directed by Architect.
 - 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
 - 1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete producer.
 - d. Concrete pavement subcontractor.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.
 - 2. Use forms free from warp and of sufficient strength when staked to hold the specified alignment during concrete placing and finishing operations.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

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- B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.
- D. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:
 - 1. Portland Cement: ASTM C 150, Type I gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - 3. Do not use fine or coarse aggregates that contain substances that cause spalling.
 - 4. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.
- C. Water: ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

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6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

1. Products:

a. Monofilament Fibers:

- 1) Axim Concrete Technologies; Fibrasol IIP.
- 2) Euclid Chemical Company (The); Fiberstrand 100.
- 3) FORTA Corporation; Forta Mono.
- 4) Grace, W. R. & Co.--Conn.; Grace MicroFiber.
- 5) Metalcrete Industries; Polystrand 1000.
- 6) SI Concrete Systems; Fibermix Stealth.
- 7) Or product equal to the above.

b. Fibrillated Fibers:

- 1) Axim Concrete Technologies; Fibrasol F.
- 2) FORTA Corporation; Forta.
- 3) Euclid Chemical Company (The); Fiberstrand F.
- 4) Grace, W. R. & Co.--Conn.; Grace Fibers.
- 5) SI Concrete Systems; Fibermesh.
- 6) Or product equal to the above.

2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

1. Products:

- a. Axim Concrete Technologies; Cimfilm.
- b. Burke by Edeco; BurkeFilm.
- c. ChemMasters; Spray-Film.
- d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
- e. Dayton Superior Corporation; Sure Film.

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- f. Euclid Chemical Company (The); Eucobar.
 - g. Kaufman Products, Inc.; Vapor Aid.
 - h. Lambert Corporation; Lambco Skin.
 - i. L&M Construction Chemicals, Inc.; E-Con.
 - j. MBT Protection and Repair, ChemRex Inc.; Confilm.
 - k. Meadows, W. R., Inc.; Sealtight Evapre.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
 - n. Sika Corporation, Inc.; SikaFilm.
 - o. Symons Corporation; Finishing Aid.
 - p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
 - q. Or product equal to the above.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- 1. Products:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - b. Burke by Edoko; Aqua Resin Cure.
 - c. ChemMasters; Safe-Cure Clear.
 - d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - f. Euclid Chemical Company (The); Kurez DR VOX.
 - g. Kaufman Products, Inc.; Thinfilm 420.
 - h. Lambert Corporation; Aqua Kure-Clear.
 - i. L&M Construction Chemicals, Inc.; L&M Cure R.
 - j. Meadows, W. R., Inc.; 1100 Clear.
 - k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
 - l. Symons Corporation; Resi-Chem Clear.
 - m. Tamms Industries Inc.; Horncure WB 30.
 - n. Unitex; Hydro Cure 309.
 - o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
 - p. Or product equal to the above.
- F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.
- 1. Products:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 WP WB.
 - b. Burke by Edoco; Resin Emulsion White.
 - c. ChemMasters; Safe-Cure 2000.
 - d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
 - f. Euclid Chemical Company (The); Kurez VOX White Pigmented.
 - g. Kaufman Products, Inc.; Thinfilm 450.
 - h. Lambert Corporation; Aqua Kure-White.
 - i. L&M Construction Chemicals, Inc.; L&M Cure R-2.
 - j. Meadows, W. R., Inc.; 1200-White.
 - k. Symons Corporation; Resi-Chem White.
 - l. Tamms Industries, Inc.; Horncure 200-W.

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- m. Unitex; Hydro White.
- n. Vexcon Chemicals, Inc.; Certi-Vex Enviocure White 100.
- o. Or product equal to the above.

2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.8 PAVEMENT MARKINGS

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type I or AASHTO M 248, Type N.

2.9 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 3000 psi (20.7 MPa).
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
 - 3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 - 1. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture, high-range, water-reducing admixture, high-range, water-reducing and retarding admixture, plasticizing and retarding admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.

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1. Fly Ash or Pozzolan: 25 percent.
 2. Ground Granulated Blast-Furnace Slag: 50 percent.
 3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- G. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd. (0.60 kg/cu. m).

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M[and ASTM C 1116]. Furnish batch certificates for each batch discharged and used in the Work.
1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), 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 pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
 2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
 3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/4 inch (6 mm) require correction according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
1. Top of Forms: Not more than 1/8 inch in 10 feet.
 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.

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3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in 10 feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 2. Provide tie bars at sides of pavement strips where indicated.
 - 3. 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 (38 mm) into concrete.

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5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 1. Locate expansion joints at intervals of 50 feet (15.25 m), unless otherwise indicated.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:
 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 (6-mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

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- E. Do not add water to concrete during delivery or at Project site.
- F. Do not add water to fresh concrete after testing.
- G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
- J. Screed pavement surfaces with a straightedge and strike off.
- K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- L. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
- M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

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3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 - 2. 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. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.
 - 4. Final Tooling: Toll edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
 - a. Radius: ¼ inch.

3.8 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 (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

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2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm). (assuming no ponded water)
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.
11. Contractor will be required to remove and replace sidewalk constructed without positive drainage (i.e. bird baths) at contractor's expense.

3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking, except as indicted by paint manufacturer.
- 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 (0.4 mm).

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3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports. Cost for the work will be billed against the geotechnical testing allowance with approval from the Architect.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Testing will be conducted randomly as directed by Architect.
 - 2. Slump: ASTM C 143/C 143M; testing will be conducted randomly as directed by Architect.
 - 3. Air Content: ASTM C 231, pressure method; testing will be conducted randomly as directed by Architect.
 - 4. Concrete Temperature: ASTM C 1064; testing will be conducted randomly as directed by Architect.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

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3.12 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Protection from damage: The Contractor shall adequately and fully protect all parts of the work against damage until completed and accepted by the Owner for maintenance. Damages shall be properly repaired by the Contractor at no additional expense to the Owner.
- E. Temporary barricades: Throughout the duration of the Contract, the Contractor shall provide temporary barricades, conforming with the latest edition of U.S. Department of Transportation's "Manual on Uniform Traffic Control Devices for Streets and Highways," properly lighted, to keep traffic off the current portion of the work.
- F. Protection of adjacent surfaces: The Contractor shall protect exposed surfaces to the work from physical damage resulting from construction activities, and from becoming stained during application of paving materials. The Contractor shall clean, repair, or replace, as required, surfaces damaged during the course of the work at no additional expense to the Owner.
- G. Protection from graffiti: Newly poured concrete roads, streets, curbs, or sidewalks shall be protected AND guarded from graffiti from passersby until the concrete has sufficiently cured to resist such molestation. Failure to prevent graffiti, or other such vandalism, shall result in the new concrete having to be removed and replaced. This requirement shall mandate the Contractor to take the necessary steps in preventing such incidents including, but not limited, to guarding the project after normal working hours.
- H. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

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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.

- B. Related Sections:

- 1. Division 07 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.
 - 2. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
 - 3. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, Samples of materials that will contact or affect joint sealants.

- 1. Use ASTM C 1087 or manufacturer's standard test method to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Submit no fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - 5. Testing will not be required if joint-sealant manufacturers submit joint-preparation data that are based on previous testing, not older than 24 months, of sealant products for compatibility with and adhesion to joint substrates and other materials matching those submitted.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.

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- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Pavement-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.
- D. Qualification Data: For qualified Installer.
- E. Product Certificates: For each type of joint sealant and accessory, from manufacturer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for joint sealants.
- G. Preconstruction Compatibility and Adhesion Test Reports: From joint-sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility with and adhesion to joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each type of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
 - 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.

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PART 2 - PRODUCTS

2.1 MATERIALS

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Nonsag, Silicone Joint Sealant for Concrete: ASTM D 5893, Type NS.
 - 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. Crafcro Inc., an ERGON company; RoadSaver Silicone.
 - b. Dow Corning Corporation; 888.
 - c. Pecora Corporation; 301 NS.

2.3 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold-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.

2.4 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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- 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.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install joint-sealant backings of kind indicated 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 using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place joint sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag 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.

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3.4 CLEANING

- A. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.6 PAVEMENT-JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Joints within cement concrete pavement.
 - 1. Joint Location:
 - a. Expansion and isolation joints in cast-in-place concrete pavement.
 - b. Contraction joints in cast-in-place concrete slabs.
 - c. Other joints as indicated on drawings including details.

END OF SECTION 32 13 73

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SECTION 32 17 23 - 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 painted markings applied to asphalt and concrete pavement.
- B. Related Requirements:
 - 1. Section 099113 "Exterior Painting" for painting exterior concrete surfaces other than pavement.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to marking pavement including, but not limited to, the following:
 - a. Pavement aging period before application of pavement markings.
 - b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
- B. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Standard Specifications for Roads and Bridges of North Carolina Department of Transportation for pavement-marking work.

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1. Measurement and payment provisions and 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. 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:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Aexcel Inc.
2. Benjamin Moore.
3. Color Wheel Paints & Coatings.
4. Columbia Paint & Coatings.
5. Conco Paints.
6. Coronado Paint Company; Insl-X Products Corporation.
7. Diamond Vogel Paints.
8. Dunn-Edwards Corporation.
9. Ennis Traffic Safety Solutions, Inc.
10. Frazee Paint.
11. General Paint.
12. Kwal Paint.
13. M.A.B. Paints.
14. McCormick Paints.
15. Parker Paint; Comex Group.
16. PPG Industries.
17. Pratt & Lambert.
18. Rodda Paint Co.
19. Rohm and Haas Company.
20. Scott Paint.
21. Sherwin-Williams Company (The).

2.2 PAVEMENT-MARKING PAINT

- A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
 1. Color: White.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is dry and in suitable condition to begin pavement marking according to 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 Architect.
- B. Allow paving 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 pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.
 - 2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal..

3.3 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.

END OF SECTION 32-17-23

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SECTION 32 92 00 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Seeding.
- 2. Turf renovation.
- 3. Erosion-control material(s).

B. Related Sections:

- 1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
- 2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- D. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- E. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- F. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- G. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

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- H. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- C. Qualification Data: For qualified landscape Installer.
- D. Product Certificates: For soil amendments and fertilizers, from manufacturer.
- E. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.
 - 1. Analysis of existing surface soil and/or imported topsoil. Testing shall be requested 15 working days prior to delivery of topsoil to the work site. Deficiencies in the topsoil shall be corrected by the contractor. Retesting cost shall be at the Contractor's expense.
 - 2. Provide randomly selected cores in non-athletic field areas of the site.
 - 3. State on sampling the variety of seed to be installed.
 - 4. Provide pH, organic content and recommendations on additives required to establish satisfactory pH for planting.
- F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required initial maintenance periods.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.
 - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 - 2. Experience: Five years' experience in turf installation in addition to requirements in Division 01 Section "Quality Requirements."
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

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4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Certified Landscape Technician - Exterior, with installation and maintenance specialty area(s), designated CLT-Exterior.
 5. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
 6. Pesticide Applicator: State licensed, commercial.
 - B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
 - C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
 1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for turf growth.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m) for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
 - D. Preinstallation Conference: Conduct conference at Project site.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
 - B. Bulk Materials:
 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

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2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.7 PROJECT CONDITIONS

- A. 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 15.
 2. Fall Planting: September 1 – November 1.
- 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.

1.8 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:
 1. Seeded Turf: 60 days from date of Substantial Completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
- B. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances. Seed shall be delivered to the site in sealed standard size containers, showing weight, analysis, name of vendor and germination test. Seed which has become wet, moldy or otherwise damaged will not be accepted. New varieties will be considered for review.

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- B. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Seed Type 1 - Balanced Mix of 3 varieties.
For general lawn areas,

Tall Fescue – Blend of three Drought resistant variety, Rebel, Rebel II, Falcon, Jaguar
Annual Ryegrass - Drought resistant variety

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. Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.

2.3 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

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2.4 PLANTING SOILS

- A. Planting Soil, re-use surface soil stockpiled from onsite striping, with pH range of 5.5 to 7, a minimum of 2 percent organic material content; free of stones 3/4 inch or larger in any dimension and other extraneous materials harmful to plant growth. Mix topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
 - 1. Weight of Lime per 1000 Sq. Ft. (92.9 Sq. m): 50 lbs/ac.
 - 2. Weight of Superphosphate per 1000 Sq. Ft. (92.9 Sq. m): 500 lbs/ac.
 - 3. Weight of Commercial Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): 1,000 lbs/ac.
 - 4. Amend soils in accordance with soil testing report recommendations.
- B. Topsoil shall contain the following specified percentages of constituents:
 - 1. Maximum 30% clay, (red clay, well pulverised); clay shall be sterile.
 - 2. Minimum 10% well-rotted organic material, sawdust, leaf mold or other approved partially decomposed organic matter.
 - 3. Maximum 40% coarse clean sandy loam free of rock, plants, roots and other debris.
 - 4. Topsoil Source: Use imported compost from Wallace Dairy Farm where noted on the plans. Otherwise re-use surface soil on the site per plans and specifications as necessary to provide topsoils to depths indicated. Topsoil shall be clean sandy loam free of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

2.5 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Non-asphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

2.6 PESTICIDES

- A. General: Pesticide, registered and approved by 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 Non-Selective): 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 Non-Selective): Effective for controlling weed growth that has already germinated.

2.7 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
 - 1. See drawings for location and material type and installation details.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 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. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling 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 and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 8 inches (200 mm). Remove all construction gravel, stones larger than $\frac{3}{4}$ inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply superphosphate fertilizer directly to subgrade before loosening.
 - 2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

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- b. Mix lime with dry soil before mixing fertilizer.
 - 3. Spread planting soil to a depth of 6 inches (50 mm) but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
 - C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
 - 1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
 - 2. Loosen surface soil to a depth of at least 8 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 6 inches of soil. Till soil to a homogeneous mixture of fine texture.
 - a. Apply superphosphate fertilizer directly to surface soil before loosening.
 - 3. Remove stones larger than 1/2 inch in any dimension and sticks, roots, trash, and other extraneous matter. Remove any construction debris or gravel.
 - 4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
 - D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
 - E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
 - F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- 3.4 SEEDING
- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed, or seed that is moldy or otherwise damaged.
 - 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
 - B. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
 - C. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.

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- D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1 inch (76 mm) in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
- E. Sow Seed at the following rate;
 - 1. Seed Type #1 for general lawn areas:
 - 270 lbs of Tall Fescue per 1 acre
 - 30 lbs of Annual Rye per 1 acre

3.5 TURF RENOVATION

- A. Renovate existing turf.
- B. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 - 2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).
- I. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.
- J. Apply seed and protect with straw mulch as required for new turf.
- K. Water newly planted areas and keep moist until new turf is established.

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3.6 TURF MAINTENANCE

- A. 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 re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow turf-type tall fescue to a height of 2 to 3 inches.
- D. Turf Post fertilization: Apply fertilizer after initial mowing and when grass is dry.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.7 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
 - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with 100% full ground coverage.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

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3.8 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with 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 Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.9 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. 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.
- C. Remove non-degradable erosion-control measures after grass establishment period.

END OF SECTION 32 92 00

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SECTION 33 05 00 - COMMON WORK RESULTS FOR UTILITIES

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. Piping joining materials.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Sleeves.
 - 5. Identification devices.
 - 6. Grout.
 - 7. Flowable fill.
 - 8. Piped utility demolition.
 - 9. Piping system common requirements.
 - 10. Equipment installation common requirements.
 - 11. Painting.
 - 12. Concrete bases.
 - 13. Metal supports and anchorages.
- B. This Section includes utility piping and related components outside the building.

1.3 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- C. ABS: Acrylonitrile-butadiene-styrene plastic.
- D. CPVC: Chlorinated polyvinyl chloride plastic.
- E. PE: Polyethylene plastic.
- F. PVC: Polyvinyl chloride plastic.

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1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Dielectric fittings.
 - 2. Identification devices.
- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

- A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.
- C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Division 03.

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PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness, unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAgl, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for Joining Plastic Piping:
 - 1. ABS Piping: ASTM D 2235.
 - 2. CPVC Piping: ASTM F 493.
 - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - 4. PVC to ABS Piping Transition: ASTM D 3138.
- H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 TRANSITION FITTINGS

- A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Transition Couplings NPS 1-1/2 (DN 40) and Smaller:
 - 1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
 - 2. Aboveground Piping: Specified piping system fitting.

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C. AWWA Transition Couplings NPS 2 (DN 50) and Larger:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cascade Waterworks Mfg. Co.
 - b. Dresser, Inc.; DMD Div.
 - c. Ford Meter Box Company, Inc. (The); Pipe Products Div.
 - d. JCM Industries.
 - e. Smith-Blair, Inc.
 - f. Viking Johnson.
2. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

2.3 SLEEVES

- A. Mechanical sleeve seals for pipe penetrations are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Galvanized-Steel Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.
- D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.
- G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.4 IDENTIFICATION DEVICES

- A. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils (0.08 mm) thick.
 1. Width: 1-1/2 inches (40 mm) on pipes with OD, including insulation, less than 6 inches (150 mm); 2-1/2 inches (65 mm) for larger pipes.
 2. Color: Comply with ASME A13.1, unless otherwise indicated.

2.5 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

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1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.6 FLOWABLE FILL

A. Description: Low-strength-concrete, flowable-slurry mix.

1. Cement: ASTM C 150, Type I, portland.
2. Density: 115- to 145-lb/cu. ft. (1840- to 2325-kg/cu. m).
3. Aggregates: ASTM C 33, natural sand, fine and crushed gravel or stone, coarse.
4. Aggregates: ASTM C 33, natural sand, fine.
5. Admixture: ASTM C 618, fly-ash mineral.
6. Water: Comply with ASTM C 94/C 94M.
7. Strength: 100 to 200 psig (690 to 1380 kPa) at 28 days.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

- A.** Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B.** Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C.** If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING INSTALLATION

- A.** Install piping according to the following requirements and Division 33 Sections specifying piping systems.

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- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Sleeves are not required for core-drilled holes.
- J. Permanent sleeves are not required for holes formed by removable PE sleeves.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 33 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

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- G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.
- I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.
- K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
 - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
 - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End PE Pipe and Fittings: Use butt fusion.
 - 2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.
- O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Install dielectric fittings at connections of dissimilar metal pipes.

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3.5 EQUIPMENT INSTALLATION

- A. Install equipment level and plumb, unless otherwise indicated.
- B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.
- C. Install equipment to allow right of way to piping systems installed at required slope.

3.6 PAINTING

- A. Painting of piped utility systems, equipment, and components is specified in Division 09 painting Sections.
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 IDENTIFICATION

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 - 1. Stenciled Markers: According to ASME A13.1.
 - 2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
 - 3. Locate pipe markers on exposed piping according to the following:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
 - c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
 - d. At manholes and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.
 - 1. Lettering Size: Minimum 1/4 inch (6.4 mm) high for name of unit if viewing distance is less than 24 inches (610 mm), 1/2 inch (13 mm) high for distances up to 72 inches (1800 mm), and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
 - 2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

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3.8 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 7. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete".

3.9 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.10 GROUTING

- A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 33 05 00

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SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

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 gravity-flow, non-pressure and storm drainage outside the building, with the following components:
 - 1. High density polyethylene pipe and fittings.
 - 2. Concrete pipe and fittings.
 - 3. Concrete.
 - 4. Catch basins.
 - 5. Curb inlets.
 - 6. Pipe outlets.
 - 7. Plastic clean outs.
 - 8. Manholes.
- B. Related sections include the following:
 - 1. Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

1.3 DEFINITIONS

- A. Drainage Piping: System of storm water piping, fittings, and appurtenances for gravity flow of storm drainage.
- B. RCP: Reinforced concrete pipe.
- C. HDPE: High Density Polyethylene pipe for roof drains.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Non-pressure, Drainage-Piping Pressure Rating: 10-foot head of water (30 kPa). Pipe joints shall be at least silt tight, unless otherwise indicated.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:

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1. Piping, Manholes, Catch Basins, Storm Water Inlets, and Storm Water Detention Structures: Include plans, elevations, sections, details, frames, covers, and grates.
- C. 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.
- D. Field quality-control test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipefittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle catch basins, storm water inlets, and other drainage structures according to manufacturer's written rigging instructions.

1.7 PROJECT RECORD DOCUMENTS

- A. Contractor shall be responsible for preparing and submitting "As-Built" drawings by a registered North Carolina Surveyor for all storm water piping systems in the project area including work installed for this contract and existing storm water piping system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS

- A. High Density Polyethylene Pipe and fittings (HDPE): According to the following:
High Density Polyethylene single wall, corrugated pipe meeting AASHTO M252; Type S. HDPE pipe will only be accepted where indicated on plans.
 1. Joints: Use bell and spigot joint meeting AASHTO M252, M294, or ASTM F2306. The joint shall be soil-tight and gasketed to meet ASTM F477.
 2. Fittings and accessories: Provide and install similar to joint angles shown on plan. Conform to AASHTO M252, M294, or ASTM F2306.
 3. Approved manufacturers:
 - a. ADS N-12 ST 1B.
 - b. Hancor.

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- c. Lane.

2.3 CONCRETE PIPE AND FITTINGS

- A. Reinforced-Concrete Pipe and Fittings: ASTM C 76 (ASTM C 76M) for pipes 12 to 144 inches, with bell-and-spigot ends and sealant joints with ASTM C 990 (ASTM C 990M), bitumen or butyl-rubber sealant.
1. Class III, Wall B.

2.4 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious materials ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (420 MPa), deformed steel.
- C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water-cementitious materials ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (420 MPa), deformed steel.

2.5 CATCH BASINS

- A. Heavy-Duty Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints. NCDOT H20 rated knockout waffle boxes with a minimum wall thickness of 5" thickness are approved for use within lawn areas. They shall not be used in any vehicular areas. If these boxes are used, the contractor shall have the structures pre-fabricated with the appropriate invert openings fabricated within the structures by the manufacturer prior to distribution from the manufacturer. Contractor has the option to score and core drill through structure to make a penetration for the pipe. Modification shall not compromise the structural stability of the storm structures. A maximum gap from pipe penetrations shall not be greater than 2". All penetrations around pipe shall be watertight. Installation of storm structures shall be approved by Architect prior to the material being delivered to the site. All storm structures shall adhere to all NCDOT Specifications. Waffle Boxes shall be approved to be used to a maximum 6'-0" depth from top of structure to slab bottom in lawn areas. All drainage structure in vehicular areas and any structure greater than 6'-0" depth shall comply with Paragraph 2.6 "Curb Inlets" below.

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1. Gaskets: Joint sealant shall meet requirements of AASHTO M198, type B.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
 3. Steps: Manufactured from deformed, ½-inch (13-mm) steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for structures less than 42 inches (1500 mm) deep.
- B. Masonry Drop Inlets (Contractor's option): Brick or block masonry structures shall be constructed in conformance with Section 830 of the North Carolina Department of Transportation Standard Specifications for Roads and Structures. The brick or block walls shall be plumb and true and without defect. Mortar conforming to ASTM C270 shall be used.
- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Provide grate and frame conforming to jurisdictional requirements and as indicated on drawings.
1. Size: As indicated on drawings.

2.6 CURB INLETS

- A. Made with Heavy-Traffic Precast Concrete Curb Inlet: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading of depth, shape, and dimensions indicated, with provision for rubber gasketed joints. NCDOT H20 rated pre-fabricated full thickness boxes with a minimum wall thickness of 5" are approved for use in all vehicular areas. Knockout waffle boxes **are not** to be used. With the use of pre-fabricated boxes, contractor shall have the structures pre-fabricated with the appropriate invert openings fabricated within the structures by the manufacturer prior to distribution from the manufacturer. Contractor has the option to score and core drill through structure to make a penetration for the pipe. Modification shall not compromise the structural stability of the storm structures. A maximum gap from pipe to edge of cut out opening shall not be greater than 3". All openings around pipe shall be watertight. Installation of storm structures shall be approved by Architect prior to the material being delivered to the site. All storm structures shall adhere to all NCDOT Specifications.
1. Gaskets: Joint sealant shall meet requirements of AASHTO M198, type B.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
 3. Steps: Manufactured from deformed, ½-inch (13-mm) steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for structures less than 42 inches (1500 mm) deep.
- B. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility and NCDOT Specifications. Include heavy-duty frames and grates.
- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Provide grate and frame conforming to jurisdictional requirements and as indicated on drawings.

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- D. Storm water inlet grates shall be ADA compliant and bicycle-safe. "Bicycle-safe" means that bicyclists can ride "smoothly" and safely over the grates when traveling across the grates from any direction at attainable speeds. Grates where bicycle tires "drop-in" or "get stuck" are not considered safe.

2.7 PIPE OUTLETS

- A. Riprap Basins: Broken, irregular size and shape, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
 - 1. As indicated on the drawings.
- B. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size, graded stone.

2.8 PLASTIC CLEAN OUTS

- A. Basis of Design Product: Subject to compliance with requirements, provide materials indicated on drawings and comparable to one of the following:
 - 1. Canplas, LLC.
 - 2. IPS Corporation.
 - 3. NDS Inc.
 - 4. Zurn Light Commercial Products.
- B. Description: PVC body with PVC threaded plug. Include PVC sewer pipefitting and riser to cleanout.

2.9 MANHOLES

- A. Heavy-Traffic Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading of depth, shape, and dimensions indicated, with provision for rubber gasketed joints. NCDOT H20 rated pre-fabricated full thickness boxes with a minimum wall thickness of 5" are approved for use in all vehicular areas and lawn areas. Knockout waffle boxes **shall not** be used. With the use of pre-fabricated boxes contractor shall have the structures pre-fabricated with the appropriate invert openings fabricated within the structures by the manufacturer prior to distribution from the manufacturer. Invert locations shall not compromise the structural stability of the storm structures. A maximum gap at pipe penetrations shall not be greater than 1/2" (prior to sealing penetration). All pipe penetrations pipe shall be watertight. Installation of structures shall be approved by Architect prior to the material being delivered to site. All structures shall comply with NCDOT Specifications.
 - 1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
 - 2. Joint Sealant: ASTM C 990 (ASTM C 990 M), bitumen or butyl rubber.
 - 3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and cover.
 - 4. Steps: Manufactured from deformed, 1/2-inch (13-mm) steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or

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anchor into sidewalls with steps at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for manholes less than 42 inches (1500 mm) deep.

5. All manhole openings shall be installed so as to minimize surface water intrusion through the lid and positioned not to impede mowing. In grassed areas, the opening shall be at or above surrounding grade with a continuous gradual slope down from the opening to accommodate a 72" mowing deck. In paved areas, the opening shall be 1" above the surrounding grade with a continuous gradual slope down from the opening; maximum slope is 1/3" per foot.
6. Outside of manhole shall be coated with bituminous material, to prevent infiltration, prior to placing in ground. Section joints shall be coated once placed in final position prior to backfill.
7. Entire manhole structure shall be rated for continuous vehicle traffic loading per North Carolina Department of Transportation (NCDOT) standards.
8. Smooth channels shall be made at the manhole invert to convey storm water through manholes. These channels shall be made using grout that has been shaped and formed. The space between the grout channel and the manhole walls shall be filled with grout that is shaped to promote drainage back into the channel. The use of brick is allowed in constructing this grout shelf, but is not allowed elsewhere in manhole construction.

Diameter of Largest Pipe	Min. Required Manhole Diameter
18" & Smaller	4' Manhole
21" to 30"	5' Manhole
36" & Larger	6' Manhole

- B. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch (610-mm) ID by 7- to 9-inch (178- to 229-mm) riser with 4-inch (100-mm) minimum width flange, and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering 'STORM SEWER' cast into cover. Ring and cover shall comply with local standards and construction details.
- C. Butyl Seals For Manholes: Butyl resin concrete sealant shall meet or exceed all requirements of AASHTO M198 for Type B Flexible Plastic Gasket. Concrete sealant shall be provided as performed plastic gaskets in the size recommended by the sealant manufacturer for the entire perimeter of the manhole section. Sealant shall be properly sized to provide a minimum compression of 50% at maximum misalignment of joint and minimum 100% fill of annular area at proper alignment of joint. A parge coat of non-shrink grout shall also be provided over all internal joints and lift holes.

2.10 STORM WATER DETENTION STRUCTURES

- A. See drawings for materials.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

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3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm water piping. Location and arrangement of piping layout take design considerations into account. 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 according to 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. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- E. Install gravity-flow, non-pressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope as indicated on drawings.
 - 2. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
 - 3. Install HDPE sewer piping according to ASTM D2321 and manufacturer's written instructions.
- F. Access to the Work shall be along public rights of way or easements indicated on the Plans. Any encroachment upon private property shall not be permitted unless the Contractor secures specific authorization from the individual property owners concerned. All properties used for access, storage, construction, etc. shall be left in "as good" condition.
- G. Contractor shall contact U-LO-CO at 1-800-632-4949 for location and flagging of utilities at least forty-eight (48) hours prior to start of excavations. See "Earthwork" specifications for additional utility locating requirements.
- H. Contractor shall be fully responsible for damage and repair or replacement of any existing utility caused by construction operations.
- I. All pipe, precast concrete manhole, drainage structures, grates; fittings shall be carefully handled to avoid damage and shall be inspected by the Architect or his representative prior to installation, preferably while suspended over the trench.
- J. The Contractor shall install temporary watertight plugs in incomplete manholes or sewer lines prior to leaving the job site for any extended period of time. At a minimum, the pipes or manholes shall be plugged at the end of each workday.
- K. Install pipe to slopes noted on drawings in the storm schedule. The maximum allowable slope variation is 1:1000 (0.1' per 100'). All storm piping shall be installed to have positive drainage (.50% min.).

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- L. Clean interior of pipe and structures of dirt and other material as work progresses.
- M. Plug ends of pipe of uncompleted work at the end of the day for non-active lines.
- N. All piping shall have three (3) feet minimum covers unless approved by Architect.
- O. Storm Pipe Bedding
 - 1. RCP – Lay gravity storm sewer lines with Category I, II or III bedding as per Design Data 40 by American Concrete Pipe Association. Compaction per Design Date 40, Type 3 installation. Class IA, IB and II per ASTM D321 may also be used. Class IA and IB must be used in wet conditions. Bedding material shall be placed on trench bottom 4-inch minimum depth. Haunching material to be Category I, II, or III, compaction per Type 3 Installation. Initial backfill from the top of the haunching material up to 12 inches above pipe top consisting of select finely divided earth, hand placed and compacted before placing the remaining backfill.
 - 2. Bedding material shall be No. 57 or No. 5 stone.

3.3 PIPE JOINT CONSTRUCTION

- A. Basic pipe joint construction is specified in Division 33 Section "Common Work Results for Utilities." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, non-pressure drainage piping according to the following:
 - 1. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
 - 2. Join HDPE sewer piping according to ASTM F477 and manufacturer's written instructions.

3.4 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated on drawings.
- B. Set frames and grates to elevations indicated on drawings.

3.5 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated on drawings.
- B. Construct riprap of broken stone, as indicated on drawings.
- C. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated on drawings.
- D. Construct energy dissipaters at outlets, as indicated on drawings.

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3.6 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318/318R.

3.7 STORMWATER DISPOSAL SYSTEM INSTALLATION

- A. Piping Systems: Excavate trenches of width and depth, and install piping system, filter fabric, and backfill according to piping manufacturer's written instructions.

3.8 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of detectable warning tape directly over piping and at outside edge of underground structures.
 - 1. Use warning tape over HDPE piping.
 - 2. Detectable Warning Tape: This tape shall provide pipeline identification, be fully detectable from above grade utility locators and be able to provide a depth reference point to top of pipe. It shall be 6" wide, installed directly on top of the pipeline and permanently secured to the pipeline at 10 ft. intervals. The tape shall consist of aluminum foil core or stainless steel tracer wires laminated between multiple layers of polyethylene tape with an overall thickness of 4 to 6 mils. Detectable core or tracer wire "circuit" shall be continuous from drainage structure to drainage structure for complete pipeline detection and location. Tape manufacturer's approved splice kits shall be used for long runs. Warning tape shall terminate just inside of drainage structure cover and be easily accessible for "clip-on" type utility location meters. The black colored lettering on the warning tape shall be abrasion resistant and be imprinted on a color-coded background that conforms to APWA color code standards.

3.9 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.
 - 1. 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. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - f. Cleaning: Sediment or debris is visible inside piping or structures.
 - 2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 3. Flush inside of piping and structures with water to remove sediment or debris.
 - 4. Reinspect and repeat procedure until results are satisfactory.

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- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soil tight joints unless required by authorities having jurisdiction.
 - b. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 33 41 00

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SECTION 33 46 00 - SUBDRAINAGE

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 subdrainage systems for the following:
 - 1. Playground

1.3 DEFINITIONS

- A. HDPE: High-density polyethylene plastic.
- B. PE: Polyethylene plastic.
- C. Subdrainage: Drainage system that collects and removes subsurface or seepage water.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Perforated-wall pipe and fittings.
 - 2. Solid-wall pipe and fittings.
 - 3. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

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2.2 PIPING MATERIALS

- A. Refer to the "Piping Applications" Article in Part 3 for applications of pipe, tube, fitting, and joining materials.

2.3 PERFORATED-WALL HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS

- A. High Density Polyethylene Pipe and fittings (HDPE): According to the following:
High Density Polyethylene single wall, corrugated pipe meeting AASHTO M252; Type S. HDPE pipe will only be accepted where indicated on plans.
 - 1. Joints: Use bell and spigot joint meeting AASHTO M252, M294, or ASTM F2306. The joint shall be soil-tight and gasketed to meet ASTM F477.
 - 2. Fittings and accessories: Provide and install similar to joint angles shown on plan. Conform to AASHTO M252, M294, or ASTM F2306.
 - 3. Approved manufacturers:
 - a. ADS N-12 ST 1B.
 - b. Hancor.
 - c. Lane.

2.4 SOLID-WALL PIPES AND FITTINGS

- A. High Density Polyethylene Pipe and fittings (HDPE): According to the following:
High Density Polyethylene single wall, corrugated pipe meeting AASHTO M252; Type S. HDPE pipe will only be accepted where indicated on plans.
 - 1. Joints: Use bell and spigot joint meeting AASHTO M252, M294, or ASTM F2306. The joint shall be soil-tight and gasketed to meet ASTM F477.
 - 2. Fittings and accessories: Provide and install similar to joint angles shown on plan. Conform to AASHTO M252, M294, or ASTM F2306.
 - 3. Approved manufacturers:
 - a. ADS N-12 ST 1B.
 - b. Hancor.
 - c. Lane.

2.5 SOIL MATERIALS

- A. Backfill, drainage course, impervious fill, and satisfactory soil materials are specified in Division 31 Section "Earth Moving."

2.6 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. (4480 to 13 440 L/min. per sq. m) when tested according to ASTM D 4491.

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1. Structure Type: woven, monofilament or multifilament.
2. Style(s): Flat.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. Locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and damage of services.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.3 PIPING APPLICATIONS

- A. Underground Subdrainage Piping:
 1. Perforated and solid wall HDPE pipe and fittings.

3.4 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
 1. Playground subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 6 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 HDPE sewer piping according to ASTM D2321 and manufacturer's written instructions.

3.5 PIPE JOINT CONSTRUCTION

- A. Join HDPE pipe and fittings according to ASTM F477 and manufacturer's written instructions.

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- B. Join perforated, PE pipe and fittings with couplings for soil-tight joints according to AASHTO's "Standard Specifications for Highway Bridges," Division II, Section 26.4.2.4, "Joint Properties"; or according to ASTM D 2321.
- C. Join PVC pipe and fittings according to ASTM D 3034 with elastomeric seal gaskets according to ASTM D 2321.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect low elevations of subdrainage system to solid-wall-piping storm drainage system or drain to daylight if indicated on drawings.

3.7 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping.
 - 1. Install detectable warning tape over HDPE piping.

3.8 FIELD QUALITY CONTROL

- A. Testing: After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

3.9 CLEANING

- A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 33 46 00