WOODLAND NORTH APARTMENTS
LAKE FOREST PARK, WA
PROJECT MANUAL BID PACKAGE #1
JANUARY 15, 2020
FOR
RETTAINING WALL REPAIR/REPLACEMENT

OWNER:
ARCHITECT:

Woodland North LLLP

600 Andover Park W. Seattle, WA 98188
119 S Main St. Ste 200 Seattle, WA 98104
WOODLAND NORTH APARTMENTS
LAKE FOREST PARK, WA
JANUARY 15th, 2020

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Woodland North LLLP will accept bids from qualified general contractors to furnish labor, materials and necessary equipment to perform the following:

**SCOPE OF WORK:** Work includes, but is not limited to, the renovations to retainer walls, finish grading, and drainage improvements; work also includes tree removal and pruning, planting of native shrubs & ground covers, enhancement of soils and planting beds for visual appearance and to improve long term stability of surfaces; and the installation of walkways, planting beds, and water conserving irrigation & sprinkler systems; and other tasks as described in the bid documents.

**PROJECT MANUAL DISTRIBUTION:**
Address: Woodland North LLLP, 600 Andover Park, Seattle, WA 98188
Distribution: * Documents are available for download on KCHA’s website at [http://www.kcha.org/business/construction/open/](http://www.kcha.org/business/construction/open/)

**PRE-BID CONFERENCE:**
Date and Time: February 6, 2020 at 10:00 A.M.
Jobsite Address: Woodland North Apartments, 3611 NE 155th St, Lake Forest Park, WA 98155.
In Addition: Contractors are strongly encouraged to attend a Pre-Bid Conference. Failure to attend a Conference will not relieve the Contractor of any responsibility for information provided at that time.
For Questions: Questions pertaining to the bid are to be sent via email to cristyt@kcha.org no later than seven (7) calendar days prior to bid due date. All responses shall be in the form of Addenda.
Posting: Addenda will be posted on KCHA’s website.

**BID GUARANTEE:**
Amount: Five (5%) Percent of the Total bid must accompany Each Bid
Payable to: Woodland North LLLP

**BIDS ARE DUE:**
Time: 2:00 P.M.
Date: February 20, 2020
Address: Woodland North LLLP
600 Andover Park West, Seattle, WA 98188
Submittal Process: * Sealed Envelope marked as “Bid Documents: Woodland North Retaining Wall & Site Renovations” (Mailing / Shipping Package or Wrapping must also be marked with this information).
Process: All Bids must be received and time and date stamped no later than the above due date and time. No Bids will be accepted after that date and time. No Fax or Email Bids will be accepted.

Woodland North LLLP is an Equal Employment Opportunity Employer and strongly encourages minority-owned and women-owned businesses, socially and economically disadvantaged businesses, and small businesses to submit bids or to participate as subcontractors and suppliers.

Woodland North LLLP reserves the right to reject any or all bids or to waive any informality in the bidding. No bid shall be withdrawn for a period of 60 calendar days subsequent to the opening of the bids without the written consent of Woodland North LLLP.

**CONTACT PERSON:** Cristy Thompson at cristyt@kcha.org
1.0 BIDDER RESPONSIBILITY CRITERIA

A. It is the intent of Owner to award a contract to a responsible bidder submitting the lowest responsive bid. Before award, the bidder must meet the following bidder responsibility criteria to be considered a responsible bidder. The bidder may be required by the Owner to submit documentation demonstrating compliance with the criteria. The bidder must:

1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of bid submittal;
2. Have a current Washington Unified Business Identifier (UBI) number;
3. If applicable:
   a. Have Industrial Insurance (workers’ compensation) coverage for the bidder’s employees working in Washington, as required in Title 51 RCW;
   b. Have a Washington Employment Security Department number, as required in Title 50 RCW;
   c. Have a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;

1.1 SUBCONTRACTOR RESPONSIBILITY

A. The Contractor shall include the language of this section in each of its first tier subcontracts, and shall require each of its subcontractors to include the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. Upon request of the Owner, the Contractor shall promptly provide documentation to the Owner demonstrating that the subcontractor meets the subcontractor responsibility criteria below. The requirements of this section apply to all subcontractors regardless of tier.

B. At the time of subcontract execution, the Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:

1. Have a current certificate of registration in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;
2. Have a current Washington Unified Business Identifier (UBI) number;
3. If applicable, have:
   a. Have Industrial Insurance (workers’ compensation) coverage for the subcontractor’s employees working in Washington, as required in Title 51 RCW;
   b. A Washington Employment Security Department number, as required in Title 50 RCW;
   c. A Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
   d. An electrical contractor license, if required by Chapter 19.28 RCW;
   e. An elevator contractor license, if required by Chapter 70.87 RCW.

1.2 SUPPLEMENTAL BIDDER RESPONSIBILITY CRITERIA

A. For the work in this project a responsible/qualified Bidder must meet the following standards:
1. Have a current certificate of registration as a contractor, in compliance with chapter 18.27 RCW, for the last three years under the same business name;
2. Have a good record of past performance that includes, but is not limited to, high quality work, ability to complete projects on time, contractor’s integrity, compliance with public policy, financial, contractual and tax obligations, as well as Federal and State rules and regulations in performing construction contracts.
3. Have a current Experience Modification Rate (EMR) of 1.0 or less, or an average EMR rate of 1.0 or less over the last three years. The requirement may, at the Owner’s sole discretion, be waived on review of a written explanation that includes details of accidents, L&I records, a Loss Ratio Report for the last five years, costs, dates of events, and changes that have been made by the contractor to reduce accidents. A current company Safety Plan shall also be reviewed.
4. Bidder shall provide evidence of previous successful completion of retaining wall & site renovation projects, of similar scope and complexity. Poor performance, lack or response, or failure to complete projects successfully within the contract time may be grounds for the rejection of bidder.

B. Subcontractors shall have had three years minimum experience licensed in Washington State in the specific specialty contracting business.

1.3 PREPARATION OF BIDS – CONSTRUCTION

A. Bids must be submitted on the Bid Form furnished by the Owner.
B. All fields and questions on required forms must be fully answered and complete. Failure to do so may result in the bid being declared non-responsive.
C. Bidders shall acknowledge receipt of all addenda to this solicitation by inserting the addenda numbers in the space provided on the Bid Form. Failure to do so may result in the bid being declared non-responsive.
   1. Bidder is responsible for ensuring that all addenda have been reviewed and included in their bid.
D. In order for a bid to be considered responsive, bidders must submit the following signed documents with their bid package:
   1. Bid Form
   2. Bidder’s Information Form
   3. Bid Guarantee
E. The Bidder agrees to hold the base bid prices for sixty (60) days from date of bid opening.

1.4 BID GUARANTEE

A. A bid guarantee in the amount of 5% of the base bid amount is required. Failure of the Bidder to provide bid guarantee shall render the bid non-responsive.
B. Acceptable forms of bid guarantee are: A bid bond or postal money order, or certified check or cashier’s check made payable to Woodland North LLLP.
C. The Owner will return bid guarantees (other than bid bonds) to unsuccessful bidders as soon as practicable, but not sooner than the execution of a contract with the successful bidder. The successful bidder’s bid guarantee will be returned to the successful bidder with its official notice to proceed with the work of the contract.

1.5 AMENDMENTS TO INVITATION TO BID

A. If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.

1.6 PRE-BID MEETING

A. All potential bidders are strongly encouraged to attend. Oral statements may not be relied upon and will not be binding or legally effective.

1.7 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE

A. Before submitting a bid, the Bidder shall carefully examine each component of the Contract Documents prepared for the Work and any other available supporting data so as to be thoroughly familiar with all the requirements.

B. The Bidder shall obtain copies of all agencies and associations guidelines and standards cited in the Contract Documents and necessary to perform the Work, including full size reproductions of material provided by Owner, at their own expense.

C. The Bidder shall make a thorough and reasonable examination of the project site, facility and conditions under which the Work is to be performed, including but not limited to: Building access; resident occupancy; fire lanes; landscaping; obstacles and character of materials which may be encountered; traffic conditions; public and private utilities; the availability and cost of labor; and available facilities for transportation, handling, and storage of materials and equipment.

1.8 EXPLANATION TO PROSPECTIVE BIDDERS

A. Any prospective bidder desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must submit a request in writing to the Owner seven (7) calendar days before the bid due date. Oral explanations or instructions given before the award of a contract will not be binding. Questions shall be submitted to:

Cristy Thompson  
Woodland North LLLP  
600 Andover Park West  
Seattle, WA 98188  
Email: cristyt@kcha.org

1.9 WAGE RATES

A. Prevailing Wage Rates are included in the Bid Documents. Contractor shall pay no less than the rates indicated to all workers, laborers, or mechanics employed in the performance of any part of the Work.
INSTRUCTIONS TO BIDDERS

1. Residential rates may be used where available.
2. The Contractor shall submit an Agreement to Pay Prevailing Wages to the Owner prior to start of Work.

1.10 TAXES

A. All taxes imposed by law shall be included in the bid amount. The Contractor shall pay the WSST to the Department of Revenue and shall furnish proof of payment to the Owner if requested.

B. Washington State retail sales tax shall be included in the contract price.

1.11 ASSURANCE OF COMPLETION

A. Payment and performance bonds for 100% of the Contract Sum, including all Change Orders and taxes imposed by law, shall be furnished for the Work, and shall be in a form acceptable to the Owner.

1.12 BID ERROR

A. In the event Bidder discovers an error in its bid, the Bidder may, under certain conditions and if before the date and time that bids are due, modify, their bid, as detailed below:

1. Prior to Date and Time Bids are Due:
   a. A Bidder may withdraw its bid at any time prior to the date and time bids are due upon written request.
   b. After withdrawing an original submitted bid, a Bidder may modify and resubmit its bid at any time prior to the date and time bids are due.

2. After the Date and Time Bids are Due:
   a. A bidder who submits an erroneous low bid may withdraw the bid. The bid withdrawal is permissible if there was an obvious error in the low bid, and the mistake is readily apparent from the bid itself.
   b. Notification: Provide to the Owner, within 24 hours of bid opening, written notification of the bidder’s intent to withdraw the bid due to error.
   c. Documentation: Provide to the Owner within 48 hours of bid opening, documentation sufficient in content to justify bid withdrawal to the satisfaction of the Owner. Include description and evidence of the error.
   d. Approval: the Owner will approve or reject the request for withdrawal in writing.
   e. Any low bidder who withdraws its bid is prohibited from bidding on the same project if it is subsequently re-solicited.

1.13 ADDITIVE OR DEDUCTIVE BID ITEMS

A. The low bid, for purposes of award, shall be the lowest responsive bid from a qualified responsible bidder offering the low aggregate amount for the base bid, plus additive or deductive bid alternates selected by the Owner.
1.14 BID EVALUATION

A. Responsive Bids: A bid will be considered responsive if it meets the conditions of the solicitation, in addition to but not limited to the following requirements:

1. Bid is received not later than the time and date specified.
2. Bid is submitted in the proper format on the form(s) provided.
3. Bid includes the complete scope of work as defined in bid package.
4. Bid does not include any exclusions or qualifications.
5. Bid includes Unit and Lump Sum Costs as listed in Proposal Form.
6. Forms are complete.

B. After bid opening, bids will be checked for correctness of bid item prices, extensions and the total bid price. Discrepancies shall be resolved by accepting the bid item prices and the corrected extensions and total bid price.

C. Responsible Bidders: the Owner will award contracts only to responsible bidders who demonstrate the ability to successfully perform under the terms and conditions as set forth in the Contract Documents and have successfully completed apartment renovation projects similar in scope and complexity.

1. Bidders must demonstrate relevant experience on similar types of projects and submit detailed information as required on the Bidder Information Form.

D. The Owner reserves the right to contact references and investigate past performance and qualifications of the Bidder, subcontractor, and project team members, including contacting third parties and/or the references provided by the Bidder.

1. The Owner may contact references for other projects including those the Bidder did not identify and/or provided references.
2. References may be asked to rate the performance of and describe their experience with project team members and subcontractors. Bidder Information may be solicited and evaluated on the following subjects: type and features of work; overall quality of project performance and quality of work; experience and technical knowledge and competence of the Bidder and Project Team Members; ability, capacity and skill to perform the Work; ability to manage submittals, requests for information, prevailing wage filings, and other paperwork; compliance with laws, ordinances, and contract provisions; and other information as deemed necessary.
3. Poor reference(s) may be justification to determine a Bidder is not responsible.

E. At the Owner's request, provide any additional explanation or information, which would assist in evaluating the qualifications of the Bidder, subcontractors, project team members, and bid price.

F. The Owner will verify information submitted and if the lowest bidder is determined to be “not responsible,” the Owner will issue, in writing, the specific reasons for this determination. The bidder may appeal this decision. The appeal must be in writing and shall be delivered to the Owner within two business days. The appeal may include additional information that was not included in the original bid documents. Woodland North LLLP will make a final determination after the receipt of the appeal. The final determination may not be appealed.

1.15 CONTRACT AWARD
A. Bonding and Insurance: Contract award will be contingent on ability to secure payment/performance bonding, and Contractor’s ability to meet the Owner insurance requirements as detailed in the Bid Documents.

B. Must, for the duration of the contract, procure and maintain Builders Risk insurance. This shall be in addition to General Liability, Automobile Liability, and Professional Liability/Errors and Omissions (if applicable) Coverage.

C. Bonding, insurance and Agreement to Pay Prevailing Wage Rates shall be submitted to the Owner within 10 days of contract award.

D. A Notice to Proceed shall be dated TBT.

E. Right to Reject Bids/Waiver: The Owner reserves the right to reject any or all bids or to waive any informalities or irregularities in the bidding.

F. Retainage Funds: The Owner will not pay interest to the Contractor for accounts where retainage funds are maintained by the Owner. As part of the procurement by which the Contractor was selected for this work, the Contractor agrees to waive any other options and has made allowances for this waiver.
GENERAL CONDITIONS

PART 1 - GENERAL PROVISIONS

1.1 DEFINITIONS

A. “Application for Payment” means a written request submitted by Contractor to Owner for payment of Work completed in accordance with the Contract Documents and approved Schedule of Values, supported by such substantiating data as Owner or A/E may require.

B. “Architect,” “Engineer,” or “A/E” means a person or entity lawfully entitled to practice architecture or engineering, representing Owner within the limits of its delegated authority.

C. “Authority Having Jurisdiction” or “AHJ” means a federal, state, local, or other regional department, or an individual such as a fire official, labor department, health department, building official, or other individual having statutory authority.

D. “Change Order” means a written instrument signed by Owner and Contractor stating their agreement upon all of the following: (1) a change in the Work; (2) the amount of the adjustment in the Contract Sum, if any, and (3) the extent of the adjustment in the Contract Time, if any.

E. “Claim” means Contractor’s exclusive remedy for resolving disputes with Owner arising from the Contract Documents (including disputes regarding the terms of a Change Order or a request for equitable adjustment), as more fully set forth in Part 8.

F. “Construction Schedule” means a schedule of the Work, in a form satisfactory to Owner, as further set forth in Part 3.2.

G. “Contract Award Amount” is the sum of the Base Bid, any accepted Alternates, and Washington State Retail Sales Tax.

H. “Contract Documents” means the Contract Form, Addenda, Instructions to Bidders, General Conditions, Bid Form and Bidder Information, applicable wage rates, drawings and specifications, hazardous material reports, performance and payment bonds, and all other parts of the bid solicitation.

I. “Contract Sum” is the total amount payable by Owner to Contractor for performance of the Work in accordance with the Contract Documents, including Washington State sales tax and all other taxes imposed by law and properly chargeable to the Work.

J. "Contract Time" is the number of consecutive Days allotted in the Contract Documents for achieving Substantial Completion of the Work.

K. “Contracting Officer” means the person delegated the authority by Owner to enter into, and/or terminate this Contract. The term includes any successor Contracting Officer and any duly authorized representative of the Contracting Officer.

L. “Contractor” means the person or entity who has agreed with Owner to perform the Work in accordance with the Contract Documents.

M. "Day" means calendar day, unless otherwise specified.

N. “Drawings” are the graphic and pictorial portions of the Contract Documents showing the design, location, and dimensions of the Work, and may include plans, elevations, sections, details, schedules, and diagrams.

O. “Final Acceptance” means the written acceptance issued to Contractor by Owner after Contractor has completed the requirements of the Contract Documents.

P. “Final Completion” means that the Work is fully and finally complete in accordance with the Contract Documents.

Q. “Force Majeure” means those acts entitling Contractor to request an equitable adjustment in the Contract Time, as more fully set forth in Part 3.5A.
R. "Furnish" means supply and deliver to Project site, ready for unpacking, assembly, installation, and similar operations.

S. "Install" means operations at project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

T. "Manager" means the person who is an authorized agent of the Owner to administer the Contract.

U. "Notice" means a written notice which has been delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended or, if delivered or sent by registered or certified mail, to the last business address known to the party giving notice.

V. "Notice to Proceed" means a notice from Owner to Contractor that defines the date on which the Contract Time begins to run.

W. "Owner" means Woodland North LLLP or its authorized representative with the authority to enter into, administer, and/or terminate the Work in accordance with the Contract Documents and make related determinations and findings.

X. "Person" means a corporation, partnership, business association of any kind, trust, company, or individual.

Y. "Prior Occupancy" means Owner’s use of all or parts of the Project before Substantial Completion, as more fully set forth in Part 6.7A.

Z. "Provide" means furnish and install, complete and ready for the intended use.

AA. "Project" means the total construction of which the Work performed in accordance with the Contract Documents may be the whole or a part and which may include construction by Owner or by separate contractors.

BB. "Project Record" means the separate set of Drawings and Specifications as further set forth in Part 4.2A.

CC. "Schedule of Values" means a written breakdown allocating the total Contract Sum to each principal category of Work, in such detail as requested by Owner.

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

EE. "Subcontract" means a contract entered into by Subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind for or in connection with the Work.

FF. "Subcontractor" means any person, other than Contractor, who agrees to furnish or furnishes any supplies, materials, equipment, or services of any kind in connection with the Work.

GG. "Substantial Completion" means that stage in the progress of the Work where the Owner has full and unrestricted use and benefit of the facilities for the purposes intended [when the construction is sufficiently complete], as more fully set forth in Part 6.6.

HH. "Work" means the construction and services required by the Contract Documents, and includes, but is not limited to, labor, materials, supplies, equipment, services, permits, and the manufacture and fabrication of components, performed, furnished, or provided in accordance with the Contract Documents.

1.2 EXECUTION AND INTENT

Contractor makes the following representations to Owner:

A. The Contract Sum is reasonable compensation for the Work and the Contract Time is adequate for the performance of the Work, as represented by the Contract Documents;
GENERAL CONDITIONS

B. Contractor has carefully reviewed the Contract Documents, had an opportunity to visit and examine the Project site, has become familiar with the local conditions in which the Work is to be performed, and has satisfied itself as to the nature, location, character, quality and quantity of the Work, the labor, materials, equipment, goods, supplies, work, services and other items to be furnished and all other requirements of the Contract Documents, as well as the surface and subsurface conditions and other matters that may be encountered at the Project site or affect performance of the Work or the cost or difficulty thereof.

C. Contractor is financially solvent, able to pay its debts as they mature, and possesses sufficient working capital to complete the Work and perform Contractor’s obligations required by the Contract Documents; and

D. Contractor is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform the obligations required by the Contract Documents and has sufficient experience and competence to do so.

E. All work is to be executed in accordance with the Building Codes, as adopted by the Authority Having Jurisdiction, and other applicable codes and generally accepted industry standards.

F. The Contract Documents are complementary. What is required by one part of the Contract Documents shall be binding as if required by all. Anything mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be of like effect as if shown or mentioned in both.

PART 2 - INSURANCE AND BONDS

2.1 INSURANCE REQUIREMENTS FOR BUILDING TRADES CONTRACTORS

A. Within 7 days from the date of the Notice of Award and prior to commencing Work, Contractor shall obtain, and maintain, for the duration of the Contract and for one year after Final Acceptance, insurance against claims for injuries to persons or damages to property that may arise from or in connection with the performance of the work hereunder by the Contractor, his agents, representatives, employees or Subcontractors. Contractor shall also maintain such insurance coverage during the performance of any corrective Work required by Part 5.15. Review of the Contractor’s insurance by Owner shall not relieve or decrease the liability of Contractor.

2.2 MINIMUM SCOPE OF INSURANCE

A. Contractors shall maintain coverages no less than:
   1. Insurance Services Office Commercial General Liability coverage.
   2. Insurance Services Office covering Automobile Liability, code 1 (any auto).
   3. Workers’ Compensation insurance as required by State law and Employer’s Liability Insurance.
   4. Builders Risk (Property / Course of Construction) insurance covering for all risks of loss.

2.3 MINIMUM LIMITS OF INSURANCE

A. Contractor shall maintain limits no less than:
   1. General Liability: $1,000,000 per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit of $2,000,000.
   2. Automobile Liability: $1,000,000 per accident for bodily injury and property damage.
   3. Employer’s Liability: $1,000,000 per accident for bodily injury/sickness or disease.

2.4 DEDUCTIBLES AND SELF INSURED RETENTION

A. Any deductibles or self-insured retentions must be declared to and approved by the Owner. At the option of the Owner, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the Owner, its officers, officials, employees and volunteers; or the Contractor shall provide a financial guarantee satisfactory to the Owner guaranteeing payment of losses and related investigations, claim administration and
defense expenses. NOTE: If this contract deals with hazardous materials or activities (i.e. lead based paint, asbestos, armed security guards), additional provisions covering those exposures must be included in order to protect the Owner’s interests.

2.5 OTHER INSURANCE PROVISIONS

A. The policies are to contain, or be endorsed to contain, the following provisions:

1. The Owner, the Property Manager, its officers, officials, employees, partners, agents and volunteers are to be covered as additional insureds under a “completed operations” type of additional insured endorsement with respect to general liability arising out of work or operations performed by or on behalf of the Contractor including materials, parts or equipment furnished in connection with such work or operations. The endorsement(s) effectuating the foregoing additional insured coverage shall be ISO form CG 20 10 11 85, or CG 20 10 10 01 issued concurrently with CG 20 37 10 01, or their equivalent as long as it provides additional insured coverage, without limitation, for (1) completed operations; (2) automobile liability arising out of vehicles owned, leased, hired, or borrowed by or on behalf of the Contractor; (3) any insurance written on a claims made basis, shall have a retroactive date that coincides with, or precedes, the commencement of any work under this contract. Evidence of such coverage shall be maintained for a minimum of six (6) years beyond the expiration of the project.

2. The Owner will not accept Certificates of Insurance alone. Improperly completed endorsements will be returned to your insured for correction by an authorized representative of the insurance company.

3. For any claims related to this project, the Contractor’s insurance coverage shall be primary insurance as respects the Owner, its officers, officials, agents, partners, employees, and volunteers. Any insurance or self-insurance maintained or expired by the Owner, its officers, officials, agents, partners, employees, volunteers shall be excess of the Contractor’s insurance and shall not contribute with it. Owner’s Insurance is Non-Contributory in claims settlement funding.

4. The “General description of agreement(s) and/or activity(s) insured” shall include reference to the activity and/or to Owner’s specific project or site name, contract number, lease number, permit number or construction approval number.

5. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be canceled or materially changed, except after thirty (30) days’ [ten (10) days for non-payment of premium] prior written notice, by certified mail, return receipt requested, has been given to the Owner.

6. Maintenance of the proper insurance for the duration of the contract is a material element of the contract. Material changes in the required coverage or cancellation of the coverage shall constitute a material breach of the contract.

2.6 ACCEPTABILITY OF INSURERS

A. Insurance is to be placed with insurers with a current A.M. Best’s rating of no less than A-:VII. The name of the Insurance Company underwriting the coverage and its address shall be noted on the endorsement form. Contractors must provide written verification of their insurer’s rating.

2.7 VERIFICATION OF COVERAGE

A. Contractor shall furnish the Owner with original certificates and amendatory endorsements effecting coverage required by this clause. All certificates and endorsements are to be received and approved by the Owner before work commences in sufficient time to permit contractor to remedy any deficiencies. The Owner reserves the right to require complete, certified copies of all required insurance policies or pertinent parts thereof, including endorsements affecting the coverage, required by these specifications at any time. Contractor shall include in its bid the cost of all insurance and bonds required to complete the base bid work and accepted alternates.

2.8 SUBCONTRACTORS

A. Subcontractors shall include the Contractor as additional insured under their policies. All coverage for subcontractors shall be subject to all of the requirements stated herein. Contractor shall be responsible for the adequacy of required coverages for subcontractors, and compile related certificates of insurance and endorsements evidencing subcontractors’ compliance.
GENERAL CONDITIONS

2.9 PAYMENT AND PERFORMANCE BONDS

A. Payment and performance bonds for 100% of the Contract Award Amount shall be furnished for the Work, using the Payment Bond and Performance Bond form AIA – form A312. Change order increases of cumulative 15% increments require revisions to the bond to match the new Contract Sum.

PART 3 - TIME AND SCHEDULE

3.1 PROGRESS AND COMPLETION

A. Contractor to meet schedule: Contractor shall diligently prosecute the Work, with adequate forces, achieve Substantial Completion within the Contract Time, and achieve Final Completion within a reasonable period thereafter.

3.2 CONSTRUCTION SCHEDULE

A. Preliminary Progress Schedule: Unless otherwise provided in Division 1, Contractor shall, within seven Days after issuance of the Notice to Proceed, submit a preliminary Construction Schedule. The Construction Schedule shall show the sequence in which Contractor proposes to perform the Work and the dates on which Contractor plans to start and finish major portions of the Work, including dates for shop drawings and other submittals, and for acquiring materials and equipment.

B. Form of Construction Schedule: Unless otherwise provided in Division 1, the Construction Schedule shall be in the form of a bar chart or critical path method analysis, as specified by Owner. The preliminary Construction Schedule may be general, showing the major portions of the Work, with a more detailed Construction Schedule submitted as directed by Owner.

C. Owner comments on Construction Schedule: Owner shall return comments on the preliminary Construction Schedule to Contractor within 7 Days of receipt. Review by Owner of Contractor’s schedule does not constitute an approval or acceptance of Contractor’s construction means, methods, or sequencing, or its ability to complete the Work within the Contract Time. Contractor shall revise and resubmit its schedule, as necessary. Owner may withhold a portion of the progress payments until a Construction Schedule has been submitted which meets the requirements of this section.

D. Monthly updates and compliance with Construction Schedule: Contractor shall utilize and comply with the Construction Schedule. On a monthly basis, or as otherwise directed by Owner, Contractor shall submit an updated Construction Schedule at its own expense to Owner indicating actual progress. If, in the opinion of Owner, Contractor is not in conformance with the Construction Schedule for reasons other than acts of Force Majeure as identified in Part 3.5, Contractor shall take such steps as are necessary to bring the actual completion dates of its work activities into conformance with the Construction Schedule, or revise the Construction Schedule to reconcile with the actual progress of the Work.

E. Contractor to notify Owner of delays: Contractor shall promptly notify Owner in writing of any actual or anticipated event which is delaying or could delay achievement of any milestone or performance of any critical path activity of the Work. Contractor shall indicate the expected duration of the delay, the anticipated effect on the Construction Schedule, and the action being or to be taken to correct the problem. Provision of such notice does not relieve Contractor of its obligation to complete the Work within the Contract Time.

3.3 OWNER’S RIGHT TO SUSPEND THE WORK FOR CONVENIENCE

A. Owner may suspend Work: Owner may, at its sole discretion, order Contractor, in writing, to suspend all or any part of the Work for up to 90 Days, or for such longer period as mutually agreed.

B. Compliance with suspension; Owner’s options: Upon receipt of a written notice suspending the Work, Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of cost of performance directly attributable to such suspension. Within a period up to 90 Days after the notice is delivered to Contractor, or within any extension of that period to which the parties shall have agreed, Owner shall either:
1. Cancel the written notice suspending the Work; or
2. Terminate the Work covered by the notice as provided in the termination provisions of Part 9.

C. Resumption of Work: If a written notice suspending the Work is cancelled or the period of the notice or any extension thereof expires, Contractor shall resume Work.

D. Equitable Adjustment for suspensions: Contractor shall be entitled to an equitable adjustment in the Contract Time, or Contract Sum, or both, for increases in the time or cost of performance directly attributable to such suspension, provided Contractor complies with all requirements set forth in Section 7.

3.4 OWNER’S RIGHT TO STOP THE WORK FOR CAUSE

A. Owner may stop Work for Contractor’s failure to perform: If Contractor fails or refuses to perform its obligations in accordance with the Contract Documents, Owner may order Contractor, in writing, to stop the Work, or any portion thereof, until satisfactory corrective action has been taken.

B. No Equitable Adjustment for Contractor’s failure to perform: Contractor shall not be entitled to an equitable adjustment in the Contract Time or Contract Sum for any increased cost or time of performance attributable to Contractor’s failure or refusal to perform or from any reasonable remedial action taken by Owner based upon such failure.

3.5 DELAY

A. Force Majeure actions not a default; Force Majeure defined: Any delay in or failure of performance by Owner or Contractor, other than the payment of money, shall not constitute a default hereunder if and to the extent the cause for such delay or failure of performance was unforeseeable and beyond the control of the party (“Force Majeure”). Acts of Force Majeure include, but are not limited to:

1. Acts of God or the public enemy;
2. Acts or omissions of any government entity;
3. Fire or other casualty for which Contractor is not responsible;
4. Quarantine or epidemic;
5. Strike or defensive lockout;
6. Unusually severe weather conditions which could not have been reasonably anticipated; and
7. Unusual delay in receipt of supplies or products which were ordered and expedited and for which no substitute reasonably acceptable to Owner was available.

B. Contract Time adjustment for Force Majeure: Contractor shall be entitled to an equitable adjustment in the Contract Time for changes in the time of performance directly attributable to an act of Force Majeure, provided it makes a request for equitable adjustment according to Part 7.2A. Contractor shall not be entitled to an adjustment in the Contract Sum resulting from an act of Force Majeure.

C. Contract Time or Contract Sum adjustment if Owner at fault: Contractor shall be entitled to an equitable adjustment in Contract Time, and may be entitled to an equitable adjustment in Contract Sum, if the cost or time of Contractor’s performance is changed due to the fault or negligence of Owner, provided the Contractor makes a request according to Parts 7.2 and 7.2A.

D. No Contract Time or Contract Sum adjustment if Contractor at fault: Contractor shall not be entitled to an adjustment in Contract Time or in the Contract Sum for any delay or failure of performance to the extent such delay or failure was caused by Contractor or anyone for whose acts Contractor is responsible.

E. Contract Time adjustment only for concurrent fault: To the extent any delay or failure of performance was concurrently caused by the Owner and Contractor, Contractor shall be entitled to an adjustment in the Contract Time for that portion of the delay or failure of performance that was concurrently caused, provided it makes a request for equitable adjustment according to Section 7.2A, but shall not be entitled to an adjustment in Contract Sum.

F. Contractor to mitigate delay impacts: Contractor shall make all reasonable efforts to prevent and mitigate the effects of any delay, whether occasioned by an act of Force Majeure or otherwise.
3.6 NOTICE TO OWNER OF LABOR DISPUTES

A. Contractor to notify Owner of labor disputes: If Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay timely performance in accordance with the Contract Documents, Contractor shall immediately give notice, including all relevant information, to Owner.

B. Pass through notification provisions to Subcontractors: Contractor agrees to insert a provision in its Subcontracts and to require insertion in all sub-subcontracts, that in the event timely performance of any such contract is delayed or threatened by delay by any actual or potential labor dispute, the Subcontractor or Sub-subcontractor shall immediately notify the next higher tier Subcontractor or Contractor, as the case may be, of all relevant information concerning the dispute.

3.7 DAMAGES FOR FAILURE TO ACHIEVE TIMELY COMPLETION

A. Liquidated Damages

1. Reason for Liquidated Damages: Timely performance and completion of the Work is essential to Owner and time limits stated in the Contract Documents are of the essence. Owner will incur serious and substantial damages if Substantial Completion of the Work does not occur within the Contract Time. However, it would be difficult if not impossible to determine the exact amount of such damages. Consequently, liquidated damages of $2000.00 per Day unless other amount indicated here or in Division 1 will be assessed.

2. Calculation of Liquidated Damages amount: The liquidated damage amounts set forth above will be assessed not as a penalty, but as liquidated damages for breach of the Contract Documents. This amount is fixed and agreed upon by and between the Contractor and Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain. This amount shall be construed as the actual amount of damages sustained by the Owner, and may be retained by the Owner and deducted from any payments to the Contractor.

3. Contractor responsible even if Liquidated Damages assessed: Assessment of liquidated damages shall not release Contractor from any further obligations or liabilities pursuant to the Contract Documents.

4. If different completion dates are specified in the contract for separate parts or stages of the Work, the amount of liquidated damages shall be assessed on those parts or stages which are delayed.

B. Actual Damages

1. Calculation of Actual Damages: Actual damages will be assessed for failure to achieve Final Completion within the time provided. Actual damages will be calculated on the basis of direct administrative, financial, and other related costs attributable to the Project from the date when Substantial Completion should have been achieved to the date Final Completion is actually achieved. The amount of these costs may be retained by Owner and deducted from any payment due Contractor.

PART 4 - SPECIFICATIONS, DRAWINGS, AND OTHER DOCUMENTS

4.1 DISCREPANCIES AND CONTRACT DOCUMENT REVIEW

A. Specifications and Drawings are basis of the Work: The intent of the Specifications and Drawings is to describe a complete Project to be constructed in accordance with the Contract Documents. Contractor shall furnish all labor, materials, equipment, tools, transportation, permits, and supplies, and perform the Work required in accordance with the Drawings, Specifications, and other provisions of the Contract Documents.

B. Parts of the Contract Documents are complementary: The Contract Documents are complementary. What is required by one part of the Contract Documents shall be binding as if required by all. Anything mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be of like effect as if shown or mentioned in both.

C. Contractor to report discrepancies in Contract Documents: Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by Owner. If, during the performance of the Work, Contractor finds a conflict, error, inconsistency, or omission in the Contract Documents, it shall promptly and before proceeding with the Work affected thereby, report such conflict, error, inconsistency, or omission to Owner in writing.
D. Contractor knowledge of discrepancy in documents - responsibility: Contractor shall do no Work without applicable Drawings, Specifications, or written modifications, or Shop Drawings where required, unless instructed to do so in writing by Owner. If Contractor performs any construction activity, and it knows or should have known that any of the Contract Documents contain a conflict, error, inconsistency, or omission, Contractor shall be responsible for the performance and shall bear the cost for its correction.

E. Contractor to perform Work implied by Contract Documents: Contractor shall provide any work or materials the provision of which is clearly implied and is within the scope of the Contract Documents even if the Contract Documents do not mention them specifically.

F. Interpretation questions referred to Owner: Questions regarding interpretation of the requirements of the Contract Documents shall be referred to the Owner.

4.2 PROJECT RECORD

A. Contractor to maintain Project Record Drawings and Specifications: Contractor shall legibly mark in ink on a separate set of the Drawings and Specifications all actual construction, including depths of foundations, horizontal and vertical locations of internal and underground utilities and appurtenances referenced to permanent visible and accessible surface improvements, field changes of dimensions and details, actual suppliers, manufacturers and trade names, models of installed equipment, and Change Order Proposals (COP). This separate set of Drawings and Specifications shall be the “Project Record.”

B. Update Project Record weekly and keep on site: The Project Record shall be maintained on the project site throughout the construction and shall be clearly labeled “PROJECT RECORD”. The Project Record shall be updated at least weekly noting all changes and shall be available to Owner at all times.

C. Final Project Record to A/E before Final Acceptance: Contractor shall submit the completed and finalized Project Record to Owner prior to Final Acceptance.

4.3 SHOP DRAWINGS

A. Definition of Shop Drawings: “Shop Drawings” means documents and other information required to be submitted to Owner by Contractor pursuant to the Contract Documents, showing in detail: the proposed fabrication and assembly of structural elements; and the installation (i.e. form, fit, and attachment details) of materials and equipment. Shop Drawings include, but are not limited to, drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, samples, and similar materials furnished by Contractor to explain in detail specific portions of the Work required by the Contract Documents. For materials and equipment to be incorporated into the Work, Contractor submittal shall include the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the item. When directed, Contractor shall submit all samples at its own expense. Owner may duplicate, use, and disclose Shop Drawings provided in accordance with the Contract Documents.

B. Approval of Shop Drawings by Contractor and A/E: Contractor shall coordinate all Shop Drawings, and review them for accuracy, completeness, and compliance with the Contract Documents and shall indicate its approval thereon as evidence of such coordination and review. Where required by law, Shop Drawings shall be stamped by an appropriate professional licensed by the state of Washington. Shop Drawings submitted to Owner without evidence of Contractor’s approval shall be returned for resubmission. Contractor shall review, approve, and submit Shop Drawings with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of Owner or separate contractors. Contractor’s submittal schedule shall allow a reasonable time for A/E review. Owner will review, approve, or take other appropriate action on the Shop Drawings. Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings until the respective submittal has been reviewed and the Owner has approved or taken other appropriate action. Owner shall respond to Shop Drawing submittals with reasonable promptness. Any Work by Contractor shall be in accordance with reviewed Shop Drawings. Submittals made by Contractor which are not required by the Contract Documents may be returned without action.

C. Contractor not relieved of responsibility when Shop Drawings approved: Approval, or other appropriate action with regard to Shop Drawings, by Owner or A/E shall not relieve Contractor of responsibility for any errors or omissions in such Shop Drawings, nor from responsibility for compliance with the requirements of the Contract Documents. Unless specified in the Contract Documents, review by Owner or A/E shall not constitute an approval of the safety precautions employed by Contractor during construction, or constitute an approval of
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Contractor’s means or methods of construction. If Contractor fails to obtain approval before installation and the item or work is subsequently rejected, Contractor shall be responsible for all costs of correction.

D. Variations between Shop Drawings and Contract Documents: If Shop Drawings show variations from the requirements of the Contract Documents, Contractor shall describe such variations in writing, separate from the Shop Drawings, at the time it submits the Shop Drawings containing such variations. If Owner approves any such variation, an appropriate Change Order will be issued. If the variation is minor and does not involve an adjustment in the Contract Sum or Contract Time, a Change Order need not be issued; however, the modification shall be recorded upon the Project Record.

E. Contractor to submit 4 copies of Shop Drawings: Unless otherwise provided in Division 1, Contractor shall submit to Owner for approval 4 copies of all Shop Drawings. Unless otherwise indicated, 3 sets of all Shop Drawings shall be retained by Owner and 1 set shall be returned to Contractor.

4.4 ORGANIZATION OF SPECIFICATIONS

A. Specification organization by trade: Specifications are prepared in sections which conform generally with trade practices. These sections are for Owner and Contractor convenience and shall not control Contractor in dividing the Work among the Subcontractors or in establishing the extent of the Work to be performed by any trade.

PART 5 - PERFORMANCE

5.1 CONTRACTOR CONTROL AND SUPERVISION

A. Contractor responsible for Means and Methods of construction: Contractor shall supervise and direct the Work, using its best skill and attention, and shall perform the Work in a skillful manner. Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work, unless the Contract Documents give other specific instructions concerning these matters. Contractor shall disclose its means and methods of construction when requested by Owner.

B. Competent Superintendent required: Performance of the Work shall be directly supervised by a competent superintendent who has authority to act for Contractor. The superintendent must be satisfactory to the Owner and shall not be changed without the prior written consent of Owner. Owner may require Contractor to remove the superintendent from the Work or Project site, if Owner reasonably deems the superintendent incompetent, careless, or otherwise objectionable, provided Owner has first notified Contractor in writing and allowed a reasonable period for transition.

C. Contractor responsible for acts and omissions of self and agents: Contractor shall be responsible to Owner for acts and omissions of Contractor, Subcontractors, and their employees and agents.

D. Contractor to employ competent and disciplined workforce: Contractor shall enforce strict discipline and good order among all of the Contractor’s employees and other persons performing the Work. Contractor shall not permit employment of persons not skilled in tasks assigned to them. Contractor’s employees shall at all times conduct business in a manner which assures fair, equal, and nondiscriminatory treatment of all persons. Owner may, by written notice, request Contractor to remove from the Work or Project site any employee Owner reasonably deems incompetent, careless, or otherwise objectionable.

E. Contractor to keep project documents on site: Contractor shall keep on the Project site a copy of the Drawings, Specifications, addenda, reviewed Shop Drawings, and permits and permit drawings.

5.2 PERMITS, FEES, AND NOTICES

A. Contractor to obtain and pay for permits: Unless otherwise provided in the Contract Documents, Contractor shall pay for and obtain all permits, licenses, and inspections necessary for proper execution and completion of the Work. Prior to Final Acceptance, the approved, signed permits shall be delivered to Owner.
B. Allowances for permit fees: If allowances for permits or utility fees are called for in the Contract Documents and set forth in Contractor’s bid, and the actual costs of those permits or fees differ from the allowances in the Contract Documents, the difference shall be adjusted by Change Order.

C. Contractor to comply with all applicable laws: Contractor shall comply with and give notices required by all federal, state, and local laws, ordinances, rules, regulations, and lawful orders of public authorities applicable to performance of the Work.

5.3 PREVAILING WAGES

A. Contractor to pay Prevailing Wages: Contractor shall pay the prevailing rate of wages to all workers, laborers, or mechanics employed in the performance of any part of the Work in accordance with the requirements of the Owner.

B. Agreement to Pay Prevailing Wages: Before commencing the Work Contractor shall submit to the Owner an Agreement to Pay Prevailing Wages.

C. Affidavit of Wages Paid: Prior to release of retainage, the Contractor shall submit to the Owner an Affidavit of Wages Paid, for the Contractor and every subcontractor, of any tier, that performed work on the Project.

D. Disputes: Disputes regarding prevailing wage rates shall be referred to the Owner.

E. Certified Payrolls: Contractor and any subcontractor shall submit a certified copy of payroll records if requested.

5.4 HOURS OF LABOR

A. Overtime: Contractor shall comply with all applicable provisions of RCW 49.28 and they are incorporated herein by reference. Pursuant to that statute, no laborer, worker, or mechanic employed by Contractor, any Subcontractor, or any other person performing or contracting to do the whole or any part of the Work, shall be permitted or required to work more than eight hours in any one calendar day, provided, that in cases of extraordinary emergency, such as danger to life or property, the hours of work may be extended, but in such cases the rate of pay for time employed in excess of eight hours of each calendar day shall be not less than one and one-half times the rate allowed for this same amount of time during eight hours of service.

5.5 NONDISCRIMINATION

A. During performance of the Work:

1. Contractor shall not discriminate against any employee or applicant for employment because of race, creed, color, national origin, sex, age, marital status, the presence of any physical, sensory, or mental disability, sexual orientation, Vietnam-era veteran status, disabled veteran status or political affiliation, nor commit any unfair practices as defined in RCW 49.60.

2. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, of any physical, sensory, or mental disability, sexual orientation, Vietnam-era veteran status, disabled veteran status, or political affiliation.

3. The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations and orders in regard to Equal Employment Opportunity including but not limited to Executive Order 11246, as amended, Section 503 of the Rehabilitation Act of 1973, as amended, and the rules, regulations, and orders of the Secretary of Labor. The Contractor shall include the terms of this Clause in every subcontract so that such term shall be binding on each Subcontractor.

4. Non-Discrimination R.C.W. 49.60: These special requirements establish minimum requirements for affirmative action and are intended to define and implement the basic discrimination provisions of these specifications. Failure to comply with these requirements may constitute grounds for application of contract default.
SAFETY PRECAUTIONS

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

B. Contractor safety responsibilities: In carrying out its responsibilities according to the Contract Documents, Contractor shall protect the lives and health of employees performing the Work and other persons who may be affected by the Work; prevent damage to materials, supplies, and equipment whether on site or stored off-site; and prevent damage to other property at the site or adjacent thereto. Contractor shall comply with all applicable laws, ordinances, rules, regulations, and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss; shall erect and maintain all necessary safeguards for such safety and protection; and shall notify owners of adjacent property and utilities when prosecution of the Work may affect them. For these purposes, the Contractor shall:

1. Follow Washington Industrial Safety and Health Act (WISHA) regional directives and provide a site-specific safety program that will require an accident prevention and hazard analysis plan for the contractor and each subcontractor on the work site. The Contractor shall submit a site-specific safety plan to the Owner’s representative prior to the initial scheduled construction meeting.

2. Provide adequate safety devices and measures including, but not limited to, the appropriate safety literature, notice, training, permits, placement and use of barricades, signs, signal lights, ladders, scaffolding, staging, runways, hoist, construction elevators, shoring, temporary lighting, grounded outlets, wiring, hazardous materials, vehicles, construction processes, and equipment required by Chapter 19.27 RCW, State Building Code (Uniform Building, Electrical, Mechanical, Fire, and Plumbing Codes); Chapter 212-12 WAC, Fire Marshal Standards, Chapter 49.17 RCW, WISHA; Chapter 296-155 WAC, Safety Standards for Construction Work; Chapter 296-65 WAC; WISHA Asbestos Standard; WAC 296-62-071, Respirator Standard; WAC 296-62, General Occupation Health Standards, WAC 296-24, General Safety and Health Standards, WAC 296-24, General Safety and Health Standards, Chapter 49.70 RCW, and Right to Know Act.

3. Comply with the State Environmental Policy Act (SEPA), Clean Air Act, Shoreline Management Act, and other applicable federal, state, and local statutes and regulations dealing with the prevention of environmental pollution and the preservation of public natural resources.

4. Post all permits, notices, and/or approvals in a conspicuous location at the construction site.

5. Provide any additional measures that the Owner determines to be reasonable and necessary for ensuring a safe environment in areas open to the public. Nothing in this part shall be construed as imposing a duty upon the Owner to prescribe safety conditions relating to employees, public, or agents of the Contractors.

C. Contractor to maintain safety records: Contractor shall maintain an accurate record of exposure data on all incidents relating to the Work resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment. Contractor shall immediately report any such incident to Owner. Owner shall, at all times, have a right of access to all records of exposure.

D. Contractor to provide HazMat training: Contractor shall provide all persons working on the Project site with information and training on hazardous chemicals in their work at the time of their initial assignment, and whenever a new hazard is introduced into their work area.

1. Information. At a minimum, Contractor shall inform persons working on the Project site of:
   a. WAC: The requirements of chapter 296-62 WAC, General Occupational Health Standards;
   b. Presence of hazardous chemicals: Any operations in their work area where hazardous chemicals are present; and
   c. Hazard communications program: The location and availability of written hazard communication programs, including the required list(s) of hazardous chemicals and material safety data sheets required by chapter 296-62 WAC.

2. Training. At a minimum, Contractor shall provide training for persons working on the Project site which includes:
   a. Detecting hazardous chemicals: Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
   b. Hazards of chemicals: The physical and health hazards of the chemicals in the work area;
c. Protection from hazards: The measures such persons can take to protect themselves from these hazards, including specific procedures Contractor, or its Subcontractors, or others have implemented to protect those on the Project site from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and

d. Hazard communications program: The details of the hazard communications program developed by Contractor, or its Subcontractors, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.

E. Hazardous, toxic or harmful substances: Contractor’s responsibility for hazardous, toxic, or harmful substances shall include the following duties:

1. Illegal use of dangerous substances: Contractor shall not keep, use, dispose, transport, generate, or sell on or about the Project site, any substances now or hereafter designated as, or which are subject to regulation as, hazardous, toxic, dangerous, or harmful by any federal, state or local law, regulation, statute or ordinance (hereinafter collectively referred to as “hazardous substances”), in violation of any such law, regulation, statute, or ordinance, but in no case shall any such hazardous substance be stored on the Project site.

2. Contractor notifications of spills, failures, inspections, and fines: Contractor shall promptly notify Owner of all spills or releases of any hazardous substances which are otherwise required to be reported to any regulatory agency and pay the cost of cleanup. Contractor shall promptly notify Owner of all failures to comply with any federal, state, or local law, regulation, or ordinance; all inspections of the Project site by any regulatory entity concerning the same; all regulatory orders or fines; and all responses or interim cleanup actions taken by or proposed to be taken by any government entity or private party on the Project site.

F. Public safety and traffic: All Work shall be performed with due regard for the safety of the public. Contractor shall perform the Work so as to cause a minimum of interruption of vehicular traffic or inconvenience to pedestrians. All arrangements to care for such traffic shall be Contractor’s responsibilities. All expenses involved in the maintenance of traffic by way of detours shall be borne by Contractor.

G. Contract to act in an emergency: In an emergency affecting the safety of life or the Work or of adjoining property, Contractor is permitted to act, at its discretion, to prevent such threatened loss or injury, and Contractor shall so act if so authorized or instructed.

H. No duty of safety by Owner or A/E: Nothing provided in this section shall be construed as imposing any duty upon Owner or A/E with regard to, or as constituting any express or implied assumption of control or responsibility over, Project site safety, or over any other safety conditions relating to employees or agents of Contractor or any of its Subcontractors, or the public.

5.7 OPERATIONS, MATERIAL HANDLING, AND STORAGE AREAS

A. Limited storage areas: Contractor shall confine all operations, including storage of materials, to Owner-approved areas.

B. Temporary buildings and utilities at Contractor expense: Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be provided by Contractor only with the consent of Owner and without expense to Owner. The temporary buildings and utilities shall be removed by Contractor at its expense upon completion of the Work.

C. Roads and vehicle loads: Contractor shall use only established roadways or temporary roadways authorized by Owner. When materials are transported in prosecuting the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by federal, state, or local law or regulation.

D. Ownership and reporting by Contractor of demolished materials: Ownership and control of all materials or facility components to be demolished or removed from the Project site by Contractor shall immediately vest in Contractor upon severance of the component from the facility or severance of the material from the Project site. Contractor shall be responsible for compliance with all laws governing the storage and ultimate disposal. Contractor shall provide Owner with a copy of all manifests and receipts evidencing proper disposal when required by Owner or applicable law.
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E. Contractor responsible for care of materials and equipment on-site: Contractor shall be responsible for the proper care and protection of its materials and equipment delivered to the Project site. Materials and equipment may be stored on the premises subject to approval of Owner. When Contractor uses any portion of the Project site as a shop, Contractor shall be responsible for any repairs, patching, or cleaning arising from such use.

F. Contractor responsible for loss of materials and equipment: Contractor shall protect and be responsible for any damage or loss to the Work, or to the materials or equipment until the date of Final Acceptance, and shall repair or replace without cost to Owner any damage or loss that may occur.

5.8 PRIOR NOTICE OF EXCAVATION

A. Excavation defined; Use of locator services: “Excavation” means an operation in which earth, rock, or other material on or below the ground is moved or otherwise displaced by any means, except the tilling of soil less than 12-inches in depth for agricultural purposes, or road ditch maintenance that does not change the original road grade or ditch flow line. Before commencing any excavation, Contractor shall engage a locate service for all underground facilities or utilities and provide notice of the scheduled commencement of excavation to all owners of underground facilities or utilities. Contractor shall pay all fees for locator services and pay for all damages caused by excavation.

5.9 UNFORESEEN PHYSICAL CONDITIONS

A. Notice requirement for concealed or unknown conditions: If Contractor encounters conditions at the site which are subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents, or unknown physical conditions of an unusual nature which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then Contractor shall give written notice to Owner promptly and in no event later than 7 Days after the first observance of the conditions. Conditions shall not be disturbed prior to such notice.

B. Adjustment in Contract Time and Contract Sum: If such conditions differ materially and cause a change in Contractor’s cost of, or time required for, performance of any part of the Work, the Contractor may be entitled to an equitable adjustment in the Contract Time or Contract Sum, or both, provided it makes a request therefore as provided in Part 7.

5.10 PROTECTION OF EXISTING STRUCTURES, EQUIPMENT, VEGETATION, UTILITIES AND IMPROVEMENTS

A. Contractor to protect and repair property: Contractor shall protect from damage all existing structures, equipment, improvements, utilities, and vegetation at or near the Project site; and on adjacent property of a third party, the locations of which are made known to or should be known by Contractor. Contractor shall repair any damage, including that to the property of a third party, resulting from failure to comply with the requirements of the Contract Documents or failure to exercise reasonable care in performing the Work. If Contractor fails or refuses to repair the damage promptly, Owner may have the necessary work performed and charge the cost to Contractor.

B. Tree and vegetation protection: Contractor shall only remove trees when specifically authorized to do so, and shall protect vegetation that will remain in place.

5.11 LAYOUT OF WORK

A. Advanced planning of the Work: Contractor shall plan and lay out the Work in advance of operations so as to coordinate all work without delay or revision.

B. Layout responsibilities: Contractor shall lay out the Work from Owner-established baselines and bench marks indicated on the Drawings, and shall be responsible for all field measurements in connection with the layout. Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the Work. Contractor shall be responsible for executing the Work to the lines and grades that may be established. Contractor shall be responsible for maintaining or restoring all stakes and other marks established.
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5.12 MATERIAL AND EQUIPMENT

A. Contractor to provide new and equivalent equipment and materials: All equipment, material, and articles incorporated into the Work shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in the Contract Documents. References in the Specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard quality and shall not be construed as limiting competition. Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of Owner, is equal to that named in the Specifications, unless otherwise specifically provided in the Contract Documents.

B. Contractor responsible for fitting parts together: Contractor shall do all cutting, fitting, or patching that may be required to make its several parts fit together properly, or receive or be received by work of others set forth in, or reasonably implied by, the Contract Documents. Contractor shall not endanger any work by cutting, excavating, or otherwise altering the Work and shall not cut or alter the work of any other contractor unless approved in advance by Owner.

C. Owner may reject defective Work: Should any of the Work be found defective, or in any way not in accordance with the Contract Documents, this work, in whatever stage of completion, may be rejected by Owner.

5.13 AVAILABILITY AND USE OF UTILITY SERVICES

A. Owner to provide and charge for utilities: Owner shall make all reasonable utilities available to Contractor from existing outlets and supplies, as specified in the Contract Documents. Unless otherwise provided in the Contract Documents, the utility service consumed shall be charged to or paid for by Contractor at prevailing rates charged to Owner or, where the utility is produced by Owner, at reasonable rates determined by Owner. Contractor will carefully conserve any utilities furnished.

B. Contractor to install temporary connections and meters: Contractor shall, at its expense and in a skillful manner satisfactory to Owner, install and maintain all necessary temporary connections and distribution lines, together with appropriate protective devices, and all meters required to measure the amount of each utility used for the purpose of determining charges. Prior to the date of Final Acceptance, Contractor shall remove all temporary connections, distribution lines, meters, and associated equipment and materials.

5.14 TESTS AND INSPECTION

A. Contractor to provide for all testing and inspection of Work: Contractor shall maintain an adequate testing and inspection program and perform such tests and inspections as are necessary or required to ensure that the Work conforms to the requirements of the Contract Documents. Contractor shall be responsible for inspection and quality surveillance of all its Work and all Work performed by any Subcontractor. Unless otherwise provided, Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. Contractor shall give Owner timely notice of when and where tests and inspections are to be made. Contractor shall maintain complete inspection records and make them available to Owner.

B. Owner may conduct tests and inspections: Owner may, at any reasonable time, conduct such inspections and tests as it deems necessary to ensure that the Work is in accordance with the Contract Documents. Owner shall promptly notify Contractor if an inspection or test reveals that the Work is not in accordance with the Contract Documents. Unless the subject items are expressly accepted by Owner, such Owner inspection and tests are for the sole benefit of Owner and do not:

1. Constitute or imply acceptance;
2. Relieve Contractor of responsibility for providing adequate quality control measures;
3. Relieve Contractor of responsibility for risk of loss or damage to the Work, materials, or equipment;
4. Relieve Contractor of its responsibility to comply with the requirements of the Contract Documents; or
5. Impair Owner’s right to reject defective or nonconforming items, or to avail itself of any other remedy to which it may be entitled.

C. Inspections or inspectors do not modify Contract Documents: Neither observations by an inspector retained by Owner, the presence or absence of such inspector on the site, nor inspections, tests, or approvals by others,
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shall relieve Contractor from any requirement of the Contract Documents, nor is any such inspector authorized to change any term or condition of the Contract Documents.

D. Contractor responsibilities on inspections: Contractor shall promptly furnish, without additional charge, all facilities, labor, material and equipment reasonably needed for performing such safe and convenient inspections and tests as may be required by Owner. Owner may charge Contractor any additional cost of inspection or testing when Work is not ready at the time specified by Contractor for inspection or testing, or when prior rejection makes reinspection or retest necessary. Owner shall perform its inspections and tests in a manner that will cause no undue delay in the Work.

5.15 CORRECTION OF NONCONFORMING WORK

A. Work covered by Contractor without inspection: If a portion of the Work is covered contrary to the requirements in the Contract Documents, it must, if required in writing by Owner, be uncovered for Owner’s observation and be replaced at the Contractor’s expense and without change in the Contract Time.

B. Payment provisions for uncovering covered Work: If, at any time prior to Final Completion, Owner desires to examine the Work, or any portion of it, which has been covered, Owner may request to see such Work and it shall be uncovered by Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an adjustment in the Contract Sum for the costs of uncovering and replacement, and, if completion of the Work is thereby delayed, an adjustment in the Contract Time, provided it makes such a request as provided in Part 7. If such Work is not in accordance with the Contract Documents, the Contractor shall pay the costs of examination and reconstruction.

C. Contractor to correct and pay for non-conforming Work: Contractor shall promptly correct Work found by Owner not to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed, or completed. Contractor shall bear all costs of correcting such nonconforming Work, including additional testing and inspections.

D. Contractor’s compliance with warranty provisions: If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or within one year after the date for commencement of any system warranties established under Part 6.7, or within the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, Contractor shall correct it promptly after receipt of written notice from Owner to do so. Owner shall give such notice promptly after discovery of the condition. This period of one year shall be extended, with respect to portions of Work first performed after Substantial Completion, by the period of time between Substantial Completion and the actual performance of the Work. Contractor’s duty to correct with respect to Work repaired or replaced shall run for one year from the date of repair or replacement. Obligations under this paragraph shall survive Final Acceptance.

E. Contractor to remove non-conforming Work: Contractor shall remove from the Project site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by Contractor nor accepted by Owner.

F. Owner may charge Contractor for non-conforming Work: If Contractor fails to correct nonconforming Work within a reasonable time after written notice to do so, Owner may replace, correct, or remove the nonconforming Work and charge the cost thereof to the Contractor.

G. Contractor to pay for damaged Work during correction: Contractor shall bear the cost of correcting destroyed or damaged Work, whether completed or partially completed, caused by Contractor’s correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

H. No Period of limitation on other requirements: Nothing contained in this section shall be construed to establish a period of limitation with respect to other obligations which Contractor might have according to the Contract Documents. Establishment of the time period of one year as described in Section 5.16D relates only to the specific obligation of Contractor to correct the Work, and has no relationship to the time within which the Contractor’s obligation to comply with the Contract Documents may be sought to be enforced, including the time within which such proceedings may be commenced.

I. Owner may accept non-conforming Work and charge Contractor: If Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, Owner may do so instead of requiring its removal and correction, in which case the Contract Sum may be reduced as appropriate and equitable.
5.16 CLEAN UP

A. Contractor to keep site clean and leave it clean: Contractor shall at all times keep the Project site, including hauling routes, infrastructures, utilities, and storage areas, free from accumulations of waste materials. Before completing the Work, Contractor shall remove from the premises its rubbish, tools, scaffolding, equipment, and materials. Upon completing the Work, Contractor shall leave the Project site in a clean, neat, and orderly condition satisfactory to Owner. If Contractor fails to clean up as provided herein, and after reasonable notice from Owner, Owner may do so and the cost thereof shall be charged to Contractor.

5.17 ACCESS TO WORK

A. Owner and A/E access to Work site: Contractor shall provide Owner and A/E access to the Work in progress wherever located.

5.18 OTHER CONTRACTS

A. Owner may award other contracts; Contractor to cooperate: Owner may undertake or award other contracts for additional work at or near the Project site. Contractor shall reasonably cooperate with the other contractors and with Owner’s employees and shall carefully adapt scheduling and perform the Work in accordance with these Contract Documents to reasonably accommodate the other work.

5.19 SUBCONTRACTORS AND SUPPLIERS

A. Subcontractor Responsibility: The Contractor shall include the language of this paragraph in each of its first tier subcontracts, and shall require each of its subcontractors to include the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. Upon request of the Owner, the Contractor shall promptly provide documentation to the Owner demonstrating that the subcontractor meets the subcontractor responsibility criteria below. The requirements of this paragraph apply to all subcontractors regardless of tier. At the time of subcontract execution, the Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:

1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;
2. Have a current Washington Unified Business Identifier (UBI) number;
3. If applicable, have:
   a. Industrial Insurance (workers’ compensation) coverage for the subcontractor’s employees working in Washington, as required in Title 51 RCW;
   b. A Washington Employment Security Department number, as required in Title 50 RCW;
   c. A Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
   d. An electrical contractor license, if required by Chapter 19.28 RCW;
   e. An elevator contractor license, if required by Chapter 70.87 RCW.

B. Provide names of Subcontractors and use qualified firms: Before submitting the first Application for Payment, Contractor shall furnish in writing to Owner the names, addresses, and telephone numbers of all Subcontractors, as well as suppliers. Contractor shall utilize Subcontractors and suppliers which are experienced and qualified, and meet the requirements of the Contract Documents, if any. Contractor shall not utilize any Subcontractor or supplier to whom the Owner has a reasonable objection, and shall obtain Owner’s written consent before making any substitutions or additions.

C. Subcontracts in writing and pass through provision: All Subcontracts must be in writing. By appropriate written agreement, Contractor shall require each Subcontractor, so far as applicable to the Work to be performed by the Subcontractor, to be bound to Contractor by terms of the Contract Documents, and to assume toward Contractor all the obligations and responsibilities which Contractor assumes toward Owner in accordance with the Contract Documents. Each Subcontract shall preserve and protect the rights of Owner in accordance with the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights. Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. However, nothing in this paragraph shall be construed to alter the contractual relations between Contractor and its Subcontractors with respect to insurance or bonds.
D. Coordination of Subcontractors; Contractor responsible for Work: Contractor shall schedule, supervise, and coordinate the operations of all Subcontractors. No Subcontracting of any of the Work shall relieve Contractor from its responsibility for the performance of the Work in accordance with the Contract Documents or any other obligations of the Contract Documents.

E. Automatic assignment of subcontracts: Each subcontract agreement for a portion of the Work is hereby assigned by Contractor to Owner provided that:

1. Effective only after termination and Owner approval: The assignment is effective only after termination by Owner for cause pursuant to Part 9.1 and only for those Subcontracts which Owner accepts by notifying the Subcontractor in writing; and
2. Owner assumes Contractor’s responsibilities: After the assignment is effective, Owner will assume all future duties and obligations toward the Subcontractor which Contractor assumed in the Subcontract.
3. Impact of bond: The assignment is subject to the prior rights of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.

5.20 WARRANTY OF CONSTRUCTION

A. Contractor warranty of Work: In addition to any special warranties provided elsewhere in the Contract Documents, Contractor warrants that all Work conforms to the requirements of the Contract Documents and is free of any defect in equipment, material, or design furnished, or workmanship performed by Contractor.

B. Contractor responsibilities: With respect to all warranties, express or implied, for Work performed or materials furnished according to the Contract Documents, Contractor shall:

1. Obtain warranties: Obtain all warranties that would be given in normal commercial practice;
2. Warranties for benefit of Owner: Require all warranties to be executed, in writing, for the benefit of Owner;
3. Enforcement of warranties: Enforce all warranties for the benefit of Owner, if directed by Owner; and
4. Contractor responsibility for subcontractor warranties: Be responsible to enforce any subcontractor’s, manufacturer’s, or supplier’s warranties should they extend beyond the period specified in the Contract Documents.

C. Warranties beyond Final Acceptance: The obligations under this section shall survive Final Acceptance.

5.21 INDEMNIFICATION

A. The Contractor hereby agrees to indemnify, defend, and hold harmless the Owner, its successors and assigns, directors, officers, officials, employees, agents, partners and volunteers (all foregoing singly and collectively “Indemnitees”) from and against any and all claims, losses, harm, costs, liabilities, damages and expenses, including, but not limited to, reasonable attorney’s fees, arising or resulting from the performance of the services, or the acts or omissions of the Contractor its successors, and assigns, employees, subcontractors or anyone acting on the contractor’s behalf in connection with the Contract Documents or its performance thereof.

B. Provided, however, that the Contractor will not be required to indemnify, defend, or save harmless the indemnitee as provided in the preceding paragraphs of this section if the claim, suit, or action for injuries, death, or damages is caused by the sole negligence of the indemnitee. Where such claims, suits, or actions result from the concurrent negligence of (a) the Indemnitee or the Indemnitee’s agents or employees and (b) the Contractor or the Contractor’s agents or employees, the indemnity provisions provided in the proceeding paragraphs of this section shall be valid and enforceable only to the extent of the Contractor’s negligence or the negligence of its agents and employees.

C. The foregoing indemnity is specifically and expressly intended to constitute a waiver of the Contractor’s immunity under Washington’s Industrial Insurance act, RCW Title 51. The parties acknowledge that these provisions were specifically negotiated and agreed upon by them. If any portion of this indemnity clause is invalid or unenforceable, it shall be deemed excised and the remaining portions of the clause shall be given full force and effect.

D. The Contractor hereby agrees to require all its Subcontractors or anyone acting under its direction or control or on its behalf in connection with or incidental to the performance of the Contract Documents to execute an
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indemnity clause identical to the preceding clauses, specifically naming the Indemnitees as indemnitee, and failure to do so shall constitute a material breach of the Contract Documents by the Contractor.

PART 6 - PAYMENTS AND COMPLETION

6.1 CONTRACT SUM

A. Taxes: The Contract Sum shall include all taxes imposed by law and properly chargeable to the Project, including retail sales tax. The contractor shall pay the WSST to the Department of Revenue and shall furnish proof of payment to the Owner if requested.

6.2 SCHEDULE OF VALUES

A. Contractor to submit Schedule of Values: Before submitting its first Application for Payment, Contractor shall submit to Owner for approval a breakdown allocating the total Contract Sum to each principal category of work, in such detail as requested by Owner (“Schedule of Values”). The approved Schedule of Values shall include appropriate amounts for demobilization, record drawings, O&M manuals, and any other requirements for Project closeout, and shall be used by Owner as the basis for progress payments. Payment for Work shall be made only for and in accordance with those items included in the Schedule of Values.

6.3 APPLICATION FOR PAYMENT

A. Monthly Application for Payment with substantiation: At monthly intervals, unless determined otherwise by Owner, Contractor shall submit to Owner an itemized Application for Payment for Work completed in accordance with the Contract Documents and the approved Schedule of Values. Each application shall be supported by such substantiating data as Owner may require.

B. Contractor certifies Subcontractors paid: By submitting an Application for Payment, Contractor is certifying that all Subcontractors have been paid, less earned retainage, as their interests appeared in the last preceding certificate of payment. By submitting an Application for Payment, Contractor is recertifying that the representations set forth in Part 1.2, are true and correct, to the best of Contractor’s knowledge, as of the date of the Application for Payment.

C. Reconciliation of Work with Progress Schedule: At the time it submits an Application for Payment, Contractor shall analyze and reconcile, to the satisfaction of Owner, the actual progress of the Work with the Progress Schedule. Each Application for Payment shall be consistent with previous applications and payments.

D. Payment for material delivered to site or stored off-site: If authorized by Owner, the Application for Payment may include request for payment for material delivered to the Project site and suitably stored, or for completed preparatory work. Payment may similarly be requested for material stored off the Project site, provided Contractor complies with or furnishes satisfactory evidence of the following:

1. Suitable facility or location: The material will be placed in a facility or location that is structurally sound, dry, lighted and suitable for the materials to be stored;
2. Facility or location within 10 miles of Project: The facility or location is located within a 10-mile radius of the Project. Other locations may be utilized, if approved in writing, by Owner;
3. Facility or location exclusive to Project’s materials: Only materials for the Project are stored within the facility or location (or a secure portion of a facility or location set aside for the Project);
4. Insurance provided on materials in facility or location: Contractor furnishes Owner a certificate of insurance extending Contractor’s insurance coverage for damage, fire, and theft to cover the full value of all materials stored, or in transit;
5. Facility or location locked and secure: The facility or location (or secure portion thereof) is continuously under lock and key, and only Contractor’s authorized personnel shall have access;
6. Owner right of access to facility or location: Owner shall at all times have the right of access in company of Contractor;
7. Contractor assumes total responsibility for stored materials: Contractor and its surety assume total responsibility for the stored materials; and
8. Contractor provides documentation and Notice when materials moved to site: Contractor furnishes to Owner certified lists of materials stored, bills of lading, invoices, and other information as may be
required, and shall also furnish Notice to Owner when materials are moved from storage to the Project site.

6.4 PROGRESS PAYMENTS

A. Owner to pay within 30 Days: Owner shall make progress payments, in such amounts as Owner determines are properly due, within 30 Days after receipt of a properly executed Application for Payment. Owner shall notify Contractor if the Application for Payment does not comply with the requirements of the Contract Documents.

B. Withholding retainage; Options for retainage: Owner shall retain 5% of the amount of each progress payment until 45 Days after Final Acceptance and receipt of all documents required by law or the Contract Documents, including consent of surety to release of the retainage. The Owner will not pay interest to the Contractor for accounts where retainage funds are maintained by the Owner. The Contractor agrees to waive any other options and has made allowances for this waiver. Owner may permit Contractor to provide an appropriate bond in lieu of the retained funds.

C. Title passes to Owner upon payment: Title to all Work and materials covered by a progress payment shall pass to Owner at the time of such payment free and clear of all liens, claims, security interests, and encumbrances. Passage of title shall not, however, relieve Contractor from any of its duties and responsibilities for the Work or materials, or waive any rights of Owner to insist on full compliance by Contractor with the Contract Documents.

D. Waivers of Lien: With each Application for Payment, submit conditional waivers lien from every entity who is lawfully entitled to file a lien arising out of the Work covered by the payment.

1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

E. Final Payment Application: Submit final Application for Payment with releases and close out supporting documentation.

F. Approved payments shall be mailed to the Contractor within 30 days.

6.5 PAYMENTS WITHHELD

A. Owner’s right to withhold payment: Owner may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any payment to such extent as may be necessary to protect Owner from loss or damage for reasons including but not limited to:

1. Non-compliant Work: Work not in accordance with the Contract Documents;
2. Remaining Work to cost more than unpaid balance: Reasonable evidence that the Work required by the Contract Documents cannot be completed for the unpaid balance of the Contract Sum;
3. Owner correction or completion Work: Work by Owner to correct defective Work or complete the Work in accordance with Section 5.15;
4. Contractor’s failure to perform: Contractor’s failure to perform in accordance with the Contract Documents; or
5. Contractor’s negligent acts or omissions: Cost or liability that may occur to Owner as the result of Contractor’s fault or negligent acts or omissions.

B. Owner to notify Contractor of withholding for unsatisfactory performance: In any case where part or all of a payment is going to be withheld for unsatisfactory performance, Owner shall notify Contractor.

6.6 SUBSTANTIAL COMPLETION

A. Substantial Completion defined: Substantial Completion is the stage in the progress of the Work when the construction is sufficiently complete, in accordance with the Contract Documents, so Owner has full and
unrestricted use and benefit of the facilities for the use for which it is intended. All Work other than incidental corrective or punch list work shall be completed. Substantial Completion shall not have been achieved if all systems and parts are not functional, if utilities are not connected and operating normally, if all required occupancy permits have not been issued, or if the Work is not accessible by normal vehicular and pedestrian traffic routes. The date Substantial Completion is achieved shall be established in writing by Owner. Contractor may request an early date of Substantial Completion which must be approved by Change Order. Owner’s occupancy of the Work or designated portion thereof does not necessarily indicate that Substantial Completion has been achieved.

6.7 PRIOR OCCUPANCY

A. Prior Occupancy defined; Restrictions: Owner may, upon written notice thereof to Contractor, take possession of or use any completed or partially completed portion of the Work (“Prior Occupancy”) at any time prior to Substantial Completion. Unless otherwise agreed in writing, Prior Occupancy shall not: be deemed an acceptance of any portion of the Work; accelerate the time for any payment to Contractor; prejudice any rights of Owner provided by any insurance, bond, guaranty, or the Contract Documents; relieve Contractor of the risk of loss or any of the obligations established by the Contract Documents; establish a date for termination or partial termination of the assessment of liquidated damages; or constitute a waiver of claims.

B. Damage; Duty to repair and warranties: Notwithstanding anything in the preceding paragraph, Owner shall be responsible for loss of or damage to the Work resulting from Prior Occupancy. Contractor’s one year duty to repair any system warranties shall begin on building systems activated and used by Owner as agreed in writing by Owner and Contractor.

6.8 FINAL COMPLETION, ACCEPTANCE, AND PAYMENT

A. Final Completion defined: Final Completion shall be achieved when the Work is fully and finally complete in accordance with the Contract Documents. The date Final Completion is achieved shall be established by a final inspection of the Work by Owner following receipt of (1) written notice from the Contractor that the Work is ready for final inspection and (2) a final Application for Payment. When the Owner finds the Work acceptable and fully performed under the Contract Documents and the Contractor has delivered to the Owner all warranties, permits, and operations manuals, the Owner will issue a Notice of Final Completion. In no case shall Final Completion constitute Final Acceptance which is a subsequent, separate, and distinct action.

B. Final Acceptance defined: Final Acceptance shall be achieved when the Contractor has completed the requirements of the Contract Documents. The date Final Acceptance is achieved shall be established by Owner in writing. Prior to Final Acceptance, Contractor shall, in addition to all other requirements in the Contract Documents, submit to Owner a written notice of any outstanding disputes or claims between Contractor and any of its Subcontractors, including the amounts and other details thereof. Neither Final Acceptance, nor final payment, shall release Contractor or its sureties from any obligations of these Contract Documents or the payment and performance bonds, or constitute a waiver of any claims by Owner arising from Contractor’s failure to perform the Work in accordance with the Contract Documents.

C. Final payment waives Claim rights: Acceptance of final payment by Contractor, or any Subcontractor, shall constitute a waiver and release to Owner of all claims by Contractor, or any such Subcontractor, for an increase in the Contract Sum or the Contract Time, and for every act or omission of Owner relating to or arising out of the Work, except for those Claims made in accordance with the procedures, including the time limits, set forth in Part 8.

PART 7 - CHANGES

7.1 CHANGE IN THE WORK

A. Changes in Work, Contract Sum, and Contract Time by Change Order: Owner may, at any time and without notice to Contractor’s surety, order additions, deletions, revisions, or other changes in the Work. These changes in the Work shall be incorporated into the Contract Documents through the execution of Change Orders. If any change in the Work ordered by Owner causes an increase or decrease in the Contract Sum or the Contract Time, an equitable adjustment shall be made as provided in Section 7.2 or 7.2A, respectively, and such adjustment(s) shall be incorporated into a Change Order.
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B. Owner may request COP from Contractor: If Owner desires to order a change in the Work, it may request a written Change Order Proposal (COP) from Contractor. Contractor shall submit a Change Order Proposal within 7 Days of the request from Owner, or within such other period as mutually agreed. Contractor’s Change Order Proposal shall be full compensation for implementing the proposed change in the Work, including any adjustment in the Contract Sum or Contract Time, and including compensation for all delays in connection with such change in the Work and for any expense or inconvenience, disruption of schedule, or loss of efficiency or productivity occasioned by the change in the Work.

C. COP negotiations: Upon receipt of the Change Order Proposal, or a request for equitable adjustment in the Contract Sum or Contract Time, or both, as provided in Sections 7.2 and 7.3, Owner may accept or reject the proposal, request further documentation, or negotiate acceptable terms with Contractor. Pending agreement on the terms of the Change Order, Owner may direct Contractor to proceed immediately with the Change Order Work. Contractor shall not proceed with any change in the Work until it has obtained Owner’s approval. All Work done pursuant to any Owner-directed change in the Work shall be executed in accordance with the Contract Documents.

D. Change Order as full payment and final settlement: If Owner and Contractor reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, such agreement shall be incorporated in a Change Order. The Change Order shall constitute full payment and final settlement of all claims for time and for direct, indirect, and consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity, related to any Work either covered or affected by the Change Order, or related to the events giving rise to the request for equitable adjustment.

E. Failure to agree upon terms of Change Order; Final offer and Claims: If Owner and Contractor are unable to reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, Contractor may at any time in writing, request a final offer from Owner. Owner shall provide Contractor with its written response within 30 Days of Contractor’s request. Owner may also provide Contractor with a final offer at any time. If Contractor rejects Owner’s final offer, or the parties are otherwise unable to reach agreement, Contractor’s only remedy shall be to file a Claim as provided in Part 8.

F. Field Authorizations: The Owner may direct the Contractor to proceed with a change in the work through a written Field Authorization when the time required to price and execute a Change Order would impact the Project.

The Field Authorization shall describe and include the following:

1. The scope of work
2. An agreed upon maximum not-to-exceed amount
3. Any estimated change to the Contract Time
4. The method of final cost determination in accordance with the requirements of Part 7 of the General Conditions
5. The supporting cost data to be submitted in accordance with the requirements of Part 7 of the General Conditions

Upon satisfactory submittal by the Contractor and approval by the Owner of supporting cost data, a Change Order will be executed. The Owner will not make payment to the Contractor for Field Authorization work until that work has been incorporated into an executed Change Order.

7.2 CHANGE IN THE CONTRACT SUM

A. Change Order Pricing - Fixed Price: When the fixed price or time and materials method is used to determine the value of any Work covered by a Change Order, or of a request for an equitable adjustment in the Contract Sum, the following procedures shall apply:

1. Contractor's Change Order proposal, or request for adjustment in the Contract Sum, shall be accompanied by a complete itemization of the costs, including labor, material, subcontractor costs, and overhead and profit. The costs shall be itemized in the manner set forth below, and shall be submitted on breakdown sheets with documentation in a form approved by Owner.

2. Any request for adjustment of Contract Sum shall include only the following items:

   a. Craft labor costs for Contractors and Subcontractors.
GENERAL CONDITIONS

1) Basic wages and benefits: Hourly rates and benefits according to applicable prevailing wages.

2) Direct supervision shall not exceed 15% of the cost of direct labor. No supervision markup shall be allowed for a working supervisor’s hours.

3) Worker’s Insurance. Direct contributions to the State for industrial insurance, medical aid, and supplemental pension by the class and rates established by L&I.


5) Safety and small tools: 4% of the sum of the amounts calculated in (1), (2), and (3) above.

b. Material Costs: Material costs shall be developed from actual known costs, supplier quotations or standard industry pricing guides and shall consider all available discounts. Freight costs, express charges, or special delivery charges shall be itemized.

c. Equipment Costs: Itemization of the type of equipment and the estimated or actual length of time the equipment appropriate for the Work is or will be used on the change in the Work. Costs will be allowed for equipment only if used solely for the changed Work, or for additional rental costs actually incurred by the Contractor. The Date Quest Rental Rate (Blue Book) shall be used as a basis for establishing rental rates of equipment not listed in the above sources. The maximum rate for standby equipment shall not exceed 50% of the applicable rate.

d. Allowance for Overhead: This allowance shall compensate Contractor for all noncraft labor, temporary construction facilities, field engineering, schedule updating, as-built drawings, home office cost, B&O taxes, office engineering, estimating costs, additional overhead because of extended time and any other cost incidental to the change in the Work. This allowance shall be strictly limited in all cases an amount not to exceed the following:

1) For Contractor, for any Work actually performed by Contractor’s own forces, 16% of the cost.

2) For each Subcontractor (including lower tier subcontractors), for any Work actually performed by its own forces, 16% of the cost.

3) For Contractor, for any Work performed by its Subcontractor(s), 6% of the amount due each Subcontractor.

4) For each Subcontractor, for any Work performed by its Subcontractor(s) of any lower tier, 5% of the amount due the sub-Subcontractor.

e. Allowance for Profit:

1) For Contractor or Subcontractor of any tier for work performed by their forces, 5% of the cost developed in accordance with subsections a, b & c above.

2) For Contractor or Subcontractor of any tier for work performed by a subcontractor of a lower tier, 5% of the Subcontractor cost.

f. Insurance or Bond Premium: The costs of any change or additional premium of Contractor’s liability insurance and public works bond arising directly from the changed Work. The costs of any change in insurance or bond premium shall be added after overhead and profit are calculated.

g. Washington State sales tax as applicable.

B. Change Order Pricing - Unit Prices

1. Work on a unit-price basis as stated in the Specifications and at the price submitted in the Bid Form or as subsequently modified.

a. Unit prices shall include reimbursement for all direct and indirect costs of the Work, including overhead and profit, and bond, insurance costs and retail sales tax; and

b. Quantities must be supported by field measurement verified by Owner.

7.3 CHANGE IN THE CONTRACT TIME

A. The Contract Time shall only be changed by a Change Order. Contractor shall immediately notify Owner, and shall include any request for a change in the Contract Time in its Change Order proposal.
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B. If the time of Contractor’s performance is changed due to an act of Force Majeure, Contractor shall request for an equitable adjustment in the Contract Time in writing within 24-hours of the occurrence.

PART 8 - CLAIMS AND DISPUTE RESOLUTION

8.1 CLAIMS PROCEDURE

A. Claim is Contractor’s remedy: If the parties fail to reach agreement on the terms of any Change Order for Owner-directed Work as provided in Part 7.1, or on the resolution of any request for an equitable adjustment in the Contract Sum as provided in Part 7.2 or the Contract Time as provided in Part 7.3, Contractor’s only remedy shall be to file a Claim with Owner as provided in this section.

B. Claim filing deadline for Contractor: Contractor shall file its Claim within 30 Days from Owner’s final offer made in accordance with Part 7.1E, or by the date of Final Acceptance, whichever occurs first.

C. Claim must cover all costs and be documented: The Claim shall be deemed to cover all changes in cost and time (including direct, indirect, impact, and consequential) to which Contractor may be entitled. It shall be fully substantiated and documented. At a minimum, the Claim shall contain the following information:

1. Factual statement of Claim: A detailed factual statement of the Claim for additional compensation and time, if any, providing all necessary dates, locations, and items of Work affected by the Claim;
2. Dates: The date on which facts arose which gave rise to the Claim;
3. Owner and A/E employees knowledgeable about Claim: The name of each employee of Owner or A/E knowledgeable about the Claim;
4. Support from Contract Documents: The specific provisions of the Contract Documents which support the Claim;
5. Identification of other supporting information: The identification of any documents and the substance of any oral communications that support the Claim;
6. Copies of supporting documentation: Copies of any identified documents, other than the Contract Documents, that support the Claim;
7. Details on Claim for Contract Time: If an adjustment in the Contract Time is sought: the specific days and dates for which it is sought; the specific reasons Contractor believes an extension in the Contract Time should be granted; and Contractor’s analysis of its Progress Schedule to demonstrate the reason for the extension in Contract Time;
8. Details on Claim for adjustment of Contract Sum: If an adjustment in the Contract Sum is sought, the exact amount sought and a breakdown of that amount into the categories set forth in, and in the detail as required by Part 7.2; and
9. Statement certifying Claim: A statement certifying, under penalty of perjury, that the Claim is made in good faith, that the supporting cost and pricing data are true and accurate to the best of Contractor’s knowledge and belief, that the Claim is fully supported by the accompanying data, and that the amount requested accurately reflects the adjustment in the Contract Sum or Contract Time for which Contractor believes Owner is liable.

D. Owner’s response to Claim filed: After Contractor has submitted a fully documented Claim that complies with all applicable provisions of Parts 7 and 8, Owner shall respond, in writing, to Contractor with a decision within 30 Days from the date the Claim is received.

E. Owner’s review of Claim and finality of decision: To assist in the review of Contractor’s Claim, Owner may visit the Project site, or request additional information, in order to fully evaluate the issues raised by the Claim. Contractor shall proceed with performance of the Work pending final resolution of any Claim. Owner’s written decision as set forth above shall be final and conclusive as to all matters set forth in the Claim, unless Contractor follows the procedure set forth in Part 8.2.

F. Waiver of Contractor rights for failure to comply with this Section: Any Claim of the Contractor against the Owner for damages, additional compensation, or additional time, shall be conclusively deemed to have been waived by the Contractor unless timely made in accordance with the requirements of this Section.
8.2 ARBITRATION

A. Timing of Contractor’s demand for arbitration: If Contractor disagrees with Owner’s decision rendered in accordance with Part 8.1D, Contractor shall provide Owner with a written demand for arbitration. No demand for arbitration of any such Claim shall be made later than 30 Days after the date of Owner’s decision on such Claim; failure to demand arbitration within said 30 Day period shall result in Owner’s decision being final and binding upon Contractor and its Subcontractors.

B. Filing of Notice for arbitration: Notice of the demand for arbitration shall be filed with the American Arbitration Association (AAA), with a copy provided to Owner. The parties shall negotiate or mediate under the Voluntary Construction Mediation Rules of the AAA, or mutually acceptable service, before seeking arbitration in accordance with the Construction Industry Arbitration Rules of AAA as follows:

1. Claims less than $30,000: Disputes involving $30,000 or less shall be conducted in accordance with the Northwest Region Expedited Commercial Arbitration Rules; or
2. Claims greater than $30,000: Disputes over $30,000 shall be conducted in accordance with the Construction Industry Arbitration Rules of the AAA, unless the parties agree to use the expedited rules.

C. Arbitration is forum for resolving Claims: All Claims arising out of the Work shall be resolved by arbitration. The judgment upon the arbitration award may be entered, or review of the award may occur, in the superior court having jurisdiction thereof. No independent legal action relating to or arising from the Work shall be maintained.

D. Owner may combine Claims into same arbitration: Claims between Owner and Contractor, Contractor and its Subcontractors, Contractor and A/E, and Owner and A/E shall, upon demand by Owner, be submitted in the same arbitration or mediation.

E. Settlement outside of arbitration to be documented in Change Order: If the parties resolve the Claim prior to arbitration judgment, the terms of the resolution shall be incorporated in a Change Order. The Change Order shall constitute full payment and final settlement of the Claim, including all claims for time and for direct, indirect, or consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity.

8.3 CLAIMS AUDITS

A. Owner may audit Claims: All Claims filed against Owner shall be subject to audit at any time following the filing of the Claim. Failure of Contractor, or Subcontractors of any tier, to maintain and retain sufficient records to allow Owner to verify all or a portion of the Claim or to permit Owner access to the books and records of Contractor, or Subcontractors of any tier, shall constitute a waiver of the Claim and shall bar any recovery.

B. Contractor to make documents available: In support of Owner audit of any Claim, Contractor shall, upon request, promptly make available to Owner the following documents:

1. Daily time sheets and supervisor’s daily reports;
2. Collective bargaining agreements;
3. Insurance, welfare, and benefits records;
4. Payroll registers;
5. Earnings records;
6. Payroll tax forms;
7. Material invoices, requisitions, and delivery confirmations;
8. Material cost distribution worksheet;
9. Equipment records (list of company equipment, rates, etc.);
11. Contracts between Contractor and each of its Subcontractors, and all lower-tier Subcontractor contracts and supplier contracts;
12. Subcontractors’ and agents’ payment certificates;
13. Cancelled checks (payroll and vendors);
14. Job cost report, including monthly totals;
15. Job payroll ledger;
16. Planned resource loading schedules and summaries;
GENERAL CONDITIONS

17. General ledger;
18. Cash disbursements journal;
19. Financial statements for all years reflecting the operations on the Work. In addition, the Owner may require, if it deems it appropriate, additional financial statements for 3 years preceding execution of the Work;
20. Depreciation records on all company equipment whether these records are maintained by the company involved, its accountant, or others;
21. If a source other than depreciation records is used to develop costs for Contractor’s internal purposes in establishing the actual cost of owning and operating equipment, all such other source documents;
22. All nonprivileged documents which relate to each and every Claim together with all documents which support the amount of any adjustment in Contract Sum or Contract Time sought by each Claim;
23. Work sheets or software used to prepare the Claim establishing the cost components for items of the Claim including but not limited to labor, benefits and insurance, materials, equipment, Subcontractors, all documents which establish the time periods, individuals involved, the hours for the individuals, and the rates for the individuals; and
24. Work sheets, software, and all other documents used by Contractor to prepare its bid.

C. Contractor to provide facilities for audit and shall cooperate: The audit may be performed by employees of Owner or a representative of Owner. Contractor, and its Subcontractors, shall provide adequate facilities acceptable to Owner, for the audit during normal business hours. Contractor, and all Subcontractors, shall make a good faith effort to cooperate with Owner’s auditors.

PART 9 - TERMINATION OF THE WORK

9.1 TERMINATION BY OWNER FOR CAUSE

A. 7 Day Notice to Terminate for Cause: Owner may, upon Notice to Contractor and to its surety, terminate (without prejudice to any right or remedy of Owner) the Work, or any part of it, for cause upon the occurrence of any one or more of the following events:

1. Contractor fails to prosecute Work: Contractor fails to prosecute the Work or any portion thereof with sufficient diligence to ensure Substantial Completion of the Work within the Contract Time;
2. Contractor bankrupt: Contractor is adjudged bankrupt, makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency;
3. Contractor fails to correct Work: Contractor fails in a material way to replace or correct Work not in conformance with the Contract Documents;
4. Contractor fails to supply workers or materials: Contractor repeatedly fails to supply skilled workers or proper materials or equipment;
5. Contractor failure to pay Subcontractors or labor: Contractor repeatedly fails to make prompt payment due to Subcontractors or for labor;
6. Contractor violates laws: Contractor materially disregards or fails to comply with laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction; or
7. Contractor in material breach of Contract: Contractor is otherwise in material breach of any provision of the Contract Documents.

B. Owner’s actions upon termination: Upon termination, Owner may at its option:

1. Take possession of Project site: Take possession of the Project site and take possession of or use all materials, equipment, tools, and construction equipment and machinery thereon owned by Contractor to maintain the orderly progress of, and to finish, the Work;
2. Accept assignment of Subcontracts: Accept assignment of subcontracts pursuant to Part 5.20; and
3. Finish the Work: Finish the Work by whatever other reasonable method it deems expedient.

C. Surety’s role: Owner’s rights and duties upon termination are subject to the prior rights and duties of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.

D. Contractor’s required actions: When Owner terminates the Work in accordance with this section, Contractor shall take the actions set forth in Part 9.2B, and shall not be entitled to receive further payment until the Work is accepted.
E. Contractor to pay for unfinished Work: If the unpaid balance of the Contract Sum exceeds the cost of finishing the Work, including compensation for A/E’s services and expenses made necessary thereby and any other extra costs or damages incurred by Owner in completing the Work, or as a result of Contractor’s actions, such excess shall be paid to Contractor. If such costs exceed the unpaid balance, Contractor shall pay the difference to Owner. These obligations for payment shall survive termination.

F. Contractor and Surety still responsible for Work performed: Termination of the Work in accordance with this section shall not relieve Contractor or its surety of any responsibilities for Work performed.

G. Conversion of “Termination for Cause” to “Termination for Convenience”: If Owner terminates Contractor for cause and it is later determined that none of the circumstances set forth in Part 9.1A exist, then such termination shall be deemed a termination for convenience pursuant to Part 9.2.

9.2 TERMINATION BY OWNER FOR CONVENIENCE

A. Owner Notice of Termination for Convenience: Owner may, upon Notice, terminate (without prejudice to any right or remedy of Owner) the Work, or any part of it, for the convenience of Owner.

B. Contractor response to termination Notice: Unless Owner directs otherwise, after receipt of a Notice of termination for either cause or convenience, Contractor shall promptly:

1. Cease Work: Stop performing Work on the date and as specified in the notice of termination;
2. No further orders or Subcontracts: Place no further orders or subcontracts for materials, equipment, services or facilities, except as may be necessary for completion of such portion of the Work as is not terminated;
3. Cancel orders and Subcontracts: Cancel all orders and subcontracts, upon terms acceptable to Owner, to the extent that they relate to the performance of Work terminated;
4. Assign orders and Subcontracts to Owner: Assign to Owner all of the right, title, and interest of Contractor in all orders and subcontracts;
5. Take action to protect the Work: Take such action as may be necessary or as directed by Owner to preserve and protect the Work, Project site, and any other property related to this Project in the possession of Contractor in which Owner has an interest; and
6. Continue performance not terminated: Continue performance only to the extent not terminated

C. Terms of adjustment in Contract Sum if Contract terminated: If Owner terminates the Work or any portion thereof for convenience, Contractor shall be entitled to make a request for an equitable adjustment for its reasonable direct costs incurred prior to the effective date of the termination, plus reasonable allowance for overhead and profit on Work performed prior to termination, plus the reasonable administrative costs of the termination, but shall not be entitled to any other costs or damages, whatsoever, provided however, the total sum payable upon termination shall not exceed the Contract Sum reduced by prior payments. Contractor shall be required to make its request in accordance with the provisions of Part 7.

D. Owner to determine whether to adjust Contract Time: If Owner terminates the Work or any portion thereof for convenience, the Contract Time shall be adjusted as determined by Owner.

PART 10 - MISCELLANEOUS PROVISIONS

10.1 GOVERNING LAW

A. Applicable law and venue: The Contract Documents and the rights of the parties herein shall be governed by the laws of the state of Washington. Venue shall be in the county in which Owner’s principal place of business is located, unless otherwise specified.

10.2 SUCCESSORS AND ASSIGNS

A. Bound to successors; Assignment of Contract: Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of each other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party shall assign the Work without written consent of the other,
except that Contractor may assign the Work for security purposes, to a bank or lending institution authorized to do business in the state of Washington. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations set forth in the Contract Documents.

10.3 MEANING OF WORDS

A. Meaning of words used in Specifications: Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the code of any governmental authority, whether such reference be specific or by implication, shall be to the latest standard specification, manual, or code in effect on the date for submission of bids, except as may be otherwise specifically stated. Wherever in these Drawings and Specifications an article, device, or piece of equipment is referred to in the singular manner, such reference shall apply to as many such articles as are shown on the drawings, or required to complete the installation.

10.4 RIGHTS AND REMEDIES

A. No waiver of rights: No action or failure to act by Owner or A/E shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall action or failure to act constitute approval or an acquiescence in a breach therein, except as may be specifically agreed in writing. Waiver of any provision of the Contract Documents shall not be construed to be a modification of the such provisions, unless the Contract Documents are modified pursuant to the Clause entitled “Contract Modifications” herein.

B. If any provision of the Contract Documents is or becomes void or unenforceable by operation of law, the remaining provisions shall be valid and enforceable.

10.5 TIME COMPUTATIONS

A. Computing time: When computing any period of time, the day of the event from which the period of time begins shall not be counted. The last day is counted unless it falls on a weekend or legal holiday, in which event the period runs until the end of the next day that is not a weekend or holiday. When the period of time allowed is less than 7 days, intermediate Saturdays, Sundays, and legal holidays are excluded from the computation.

10.6 RECORDS RETENTION AND REPORTING

A. Record keeping: The Contractor and all Subcontractors shall maintain accounts and records in accordance with State Auditor’s procedures, including personnel, property, financial and programmatic records which sufficiently and properly reflect all direct and indirect costs of any nature expended and services performed in the performance of the Contract Documents and other such records as may be deemed necessary by the Owner to ensure proper accounting for all funds contributed by the Owner to the performance of the Contract Documents and compliance with this Contract.

B. Six year records retention period: Contractor and its Subcontractors shall maintain these records for a period of not less than 6 years after the date of Final Acceptance.

10.7 THIRD-PARTY AGREEMENTS

A. No third party relationships created: The Contract Documents shall not be construed to create a contractual relationship of any kind between: A/E and Contractor; Owner and any Subcontractor; or any persons other than Owner and Contractor. Contractor is an independent contractor with respect to the Work. Nothing in the Contract Documents shall be considered to create a relationship of employer and employee between the parties hereto. Neither the Contractor nor any employee of the Contractor shall be entitled to any benefits accorded Owner employees by virtue of the services provided. The Owner shall not be responsible for withholding or otherwise deducting federal income tax or social security or contributing to the State Industrial Insurance Program, or otherwise assuming the duties of an employer with respect to the Contractor, or any employees of the Contractor.
10.8 ANTITRUST ASSIGNMENT
A. Contractor assigns overcharge amounts to Owner: Owner and Contractor recognize that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by the purchaser. Therefore, Contractor hereby assigns to Owner any and all claims for such overcharges as to goods, materials, and equipment purchased in connection with the Work performed in accordance with the Contract Documents, except as to overcharges which result from antitrust violations commencing after the Contract Sum is established and which are not passed on to Owner under a Change Order. Contractor shall put a similar clause in its Subcontracts, and require a similar clause in its sub-Subcontracts, such that all claims for such overcharges on the Work are passed to Owner by Contractor.

10.9 AUDITS AND INSPECTIONS
A. The records and documents with respect to all matters covered by the Contract Documents shall be subject at all times to inspection, review or audit by the Owner or any other government agency so authorized by law during the performance of the Work. The Owner shall have the right to an annual audit of the Contractor's financial statement and condition.

10.10 ORGANIZATION CONFLICTS OF INTEREST
A. The Contractor warrants that, to the best of its knowledge and belief and except as otherwise disclosed, it does not have any organizational conflict of interest which is defined as a situation in which the nature of work under the Contract Documents and the Contractor's organizational, financial, contractual or other interests are such that:
   1. Award of the Work may result in an unfair competitive advantage; or
   2. The Contractor's objectivity in performing the Work may be impaired.
B. The Contractor agrees that if after award it discovers an organizational conflict of interest with respect to performance of the Work, it shall make an immediate and full disclosure in writing to the Contracting Officer, which shall include a description of the action the Contractor has taken or intends to take to eliminate or neutralize the conflict. The Owner may, however, terminate the Work if it deems the action to be in the best interest of the Owner.
C. In the event the Contractor was aware of an organizational conflict of interest before the award of this Contract and intentionally did not disclose the conflict to the Contracting Officer, the Owner may terminate the Work for cause.
D. The provisions of this Section 10.11 shall be included in all subcontracts and consulting agreements wherein the work to be performed is similar to the services provided by the Contractor. The Contractor shall include in such subcontracts and consulting agreements any necessary provisions to eliminate or neutralize conflicts of interest.

10.11 INTERESTS OF MEMBERS OF CONGRESS
A. No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of the Contract Documents or to any benefit to arise therefrom, but this provision shall not be construed to extend to the Contract Documents if made with a corporation for its general benefit.

10.12 HEADINGS AND CAPTIONS
A. Headings for convenience only: All headings and captions used in these General Conditions are only for convenience of reference, and shall not be used in any way in connection with the meaning, effect, interpretation, construction, or enforcement of the General Conditions, and do not define the limit or describe the scope or intent of any provision of these General Conditions.
PROJECT NAME AND LOCATION:

<table>
<thead>
<tr>
<th>Woodland North Renovations</th>
<th>Contract Number: TC2004231</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retaining Wall &amp; Site Renovations</td>
<td></td>
</tr>
</tbody>
</table>

BID FORM

The undersigned, Legal Name of Bidder: ________________________________
on this date: ______________________, 2020, having familiarized him/herself with the contract
documents, site conditions, and has field verified all measurements contained in the project manual as
prepared by the Owner, hereby proposes to furnish labor, materials and necessary equipment – all
including, but not limited to, demolition, disposal, new installation and the required applicable taxes and
fees to complete the work for the following bid amounts:

| BASE BID | ($__________ ) |
|---------------------------|
| RETAIL SALES TAX | ($__________ ) |

TOTAL BASE BID ($__________ )

ADDENDA

Acknowledge receipt of any addenda by inserting the number(s) above

In submitting this bid, it is understood that the right is reserved by the Owner to reject any and all bids.
The undersigned hereby agrees that this proposal shall be a valid and firm offer for a period of Sixty (60)
calendar days from the date of Bid Opening.

Bidder agrees that Work will be substantially complete and ready for final payment in accordance with
the Contract Documents on or before the date, within the number of calendar days indicated.

I certify (or declare) under penalty of perjury under the laws of the State of Washington that the foregoing
is true and correct.

________________________________________  ________________________________
Signature of Bidder  Print Your Name

Submitted on ________________________ day of ________________________ 2020

________________________________________  ________________________________
City  State
BIDDER INFORMATION

Name of Bidder (Company): ____________________________________________________________

Address: ________________________________________________________________________

Contact Name: ____________________________________________________________________

Phone Number: _______________________ Email Address: ________________________________

Business Type: General Contractor ( ) Other ( ) (Please specify): _________________________

Bidder is a(n): □ Individual □ Partnership □ Joint Venture □ Incorporated in the state of __________

List business names & associated UBI # used by Bidder during the past 5 years if different than above:
_________________________________________________________________________________

Bidder has been in business continuously from: _________________________________________

Month, Year

Business License #: ________________________ Federal ID #: ___________________________

Current UBI #: ________________________ Dept. of L&I Worker's Comp. Acct. #: ______________

Bidder has experience in work "Similar in Scope and Complexity" comparable to that required for this Project:
As a prime contractor for ____________ years. As a subcontractor for ____________ years.

<table>
<thead>
<tr>
<th>OWNER(S) OF COMPANY (List all owners):</th>
<th>OWNER’S SOCIAL SECURITY NUMBER (only required if sole proprietorship):</th>
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No. of regular full-time employees other than owner(s): _______________________________

Indicate clearly the kind of work your company will actually perform in this project:
_________________________________________________________________________________

Approximate % of work your company will actually perform: ________________________________

List the supervisory personnel to be employed by the Bidder and available for, and intended to, work on this project:

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>How Long With Bidder</th>
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## BIDDER INFORMATION

### SUBCONTRACTORS

Do you intend to use Subcontractor(s) in this project? Yes □ No □ (If yes, you must show the name of the subcontractors. Attach additional pages as necessary.)

<table>
<thead>
<tr>
<th>Subcontractors Name</th>
<th>Subcontractor’s UBI#</th>
<th>Phone Number</th>
<th>Trade</th>
<th>Years in Business</th>
</tr>
</thead>
<tbody>
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<td>1.</td>
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</table>

### BIDDER’S EXPERIENCE

Projects successfully supervised and completed by your company for work of similar scope and value as specified in bid documents in the last 5 years. Attach additional pages as necessary.

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Completion Date</th>
<th>Duration (Months)</th>
<th>Nature of Work</th>
<th>Amount of Contract</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
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<td>5.</td>
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</table>

<table>
<thead>
<tr>
<th>Owner’s Name (of project listed above)</th>
<th>Project Address</th>
<th>Contact Person</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<td>5.</td>
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</tbody>
</table>

Has Bidder ever been found guilty of violating any State or Federal employment laws? □ No □ Yes
If yes, give details & attach additional pages as necessary: ________________________________

______________________________

Has Bidder ever filed for protection under any provision of the federal bankruptcy laws or state insolvency laws? □ No □ Yes
If yes, give details & attach additional pages as necessary: ________________________________

______________________________
BIDDER INFORMATION

Has any lien, claim and/or adverse legal action related to construction been rendered against Bidder in the past five years? (i.e., open claims, lawsuits, warrants, judgments including but not limited to those that would show on the L&I website) □ No □ Yes If yes, give details & attach additional pages as necessary: ____________________________

Has Bidder or any of its employees filed any claims with Washington State Worker's Compensation or other insurance company for accidents resulting in fatal injury or dismemberment in the past 5 years? □ No □ Yes If yes, please state:

<table>
<thead>
<tr>
<th>Date</th>
<th>Type of Injury</th>
<th>Agency Receiving Claim</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

Bidder's current Experience Modification Rate (EMR): ____________________________

(If Bidder is self-insured, attach proof of EMR stated, showing complete worksheet calculations)

The bidder hereby certifies that the information contained in this Bidder's Information is accurate, complete and current.

BY: ____________________________ NAME: ____________________________
   (signature)                        (print)

TITLE: ____________________________ DATE: ____________________________
<table>
<thead>
<tr>
<th>County</th>
<th>Trade</th>
<th>Job Classification</th>
<th>Wage</th>
</tr>
</thead>
<tbody>
<tr>
<td>King</td>
<td>Asbestos Abatement Workers</td>
<td>Journey Level</td>
<td>$50.86</td>
</tr>
<tr>
<td>King</td>
<td>Building Service Employees</td>
<td>Janitor</td>
<td>$25.58</td>
</tr>
<tr>
<td>King</td>
<td>Cabinet Makers (In Shop)</td>
<td>Journey Level</td>
<td>$22.74</td>
</tr>
<tr>
<td>King</td>
<td>Landscape Construction</td>
<td>Landscape Construction/Landscaping Or Planting Laborers</td>
<td>$39.18</td>
</tr>
<tr>
<td>King</td>
<td>Landscape Construction</td>
<td>Landscape Operator</td>
<td>$68.02</td>
</tr>
<tr>
<td>King</td>
<td>Playground &amp; Park Equipment Installers</td>
<td>Journey Level</td>
<td>$12.00</td>
</tr>
<tr>
<td>King</td>
<td>Residential Brick Mason</td>
<td>Journey Level</td>
<td>$58.82</td>
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<tr>
<td>King</td>
<td>Residential Carpenters</td>
<td>Journey Level</td>
<td>$32.06</td>
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<tr>
<td>King</td>
<td>Residential Cement Masons</td>
<td>Journey Level</td>
<td>$29.25</td>
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<tr>
<td>King</td>
<td>Residential Drywall Applicators</td>
<td>Journey Level</td>
<td>$46.43</td>
</tr>
<tr>
<td>King</td>
<td>Residential Drywall Tapers</td>
<td>Journey Level</td>
<td>$47.17</td>
</tr>
<tr>
<td>King</td>
<td>Residential Electricians</td>
<td>Journey Level</td>
<td>$36.01</td>
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<tr>
<td>King</td>
<td>Residential Glaziers</td>
<td>Journey Level</td>
<td>$44.15</td>
</tr>
<tr>
<td>King</td>
<td>Residential Insulation Applicators</td>
<td>Journey Level</td>
<td>$29.87</td>
</tr>
<tr>
<td>King</td>
<td>Residential Laborers</td>
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Woodland North LLLP
600 Andover Park West
Seattle, WA 98188

**Agreement to Pay Prevailing Wages**

Contractor certifies that all workers, laborers, or mechanics employed in the performance of any part of the Work shall be paid the prevailing rate of wages to in accordance with the requirements of the Owner and the Wage Rate Schedule. Form must be filed with the Owner prior to commencement of Work.

<table>
<thead>
<tr>
<th>Company Details</th>
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<tbody>
<tr>
<td><strong>Company Name:</strong></td>
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<tr>
<td><strong>Address:</strong></td>
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<td><strong>Contractor Registration No.:</strong></td>
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<tr>
<td><strong>WA UBI Number:</strong></td>
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<td><strong>Phone Number:</strong></td>
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<td><strong>Industrial Insurance Account ID:</strong></td>
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<td><strong>Email Address:</strong></td>
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<th>Prime Contractor</th>
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<tr>
<td><strong>Company Name</strong></td>
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<td><strong>Contractor Registration No.:</strong></td>
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<td><strong>WA UBI Number:</strong></td>
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<tr>
<th>Project Information</th>
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<tbody>
<tr>
<td><strong>Contract Number:</strong> TC2004231</td>
</tr>
<tr>
<td><strong>Project Name:</strong> Woodland North Retaining Wall &amp; Site Renovations</td>
</tr>
<tr>
<td><strong>Contract Amount:</strong></td>
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<tr>
<td><strong>Project Site Address:</strong> 3611 NE 155th St. Lake Forest Park, WA 98155</td>
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### Intent Details

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<th>Expected project start date: (MM-DD-YYYY)</th>
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<tr>
<td>Will your company have employees perform work on this project?</td>
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<tr>
<td>Do you intend to use any apprentices? (Apprentices are considered employees.)</td>
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### Journey Level Wages

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<thead>
<tr>
<th>County</th>
<th>Trade</th>
<th>Wage</th>
<th>Fringe</th>
<th># Workers</th>
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### Apprentice Level Wages

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<tr>
<th>Step</th>
<th>Trade</th>
<th>Wage %</th>
<th>Wage</th>
<th>Fringe</th>
<th># Workers</th>
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</table>
Contractor certifies that all workers, laborers, or mechanics employed in the performance of any part of the Work have been paid the prevailing rate of wages to in accordance with the requirements of the Owner and the Wage Rate Schedule. Form must be filed with the Owner prior to Final Acceptance.

## Company Details

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Address:</td>
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<tr>
<td>Contractor Registration No.</td>
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<td>Industrial Insurance Account ID</td>
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<td>Filed By</td>
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## Project Information

<table>
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<tr>
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<th>TC2004231</th>
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<tr>
<td>Project Name</td>
<td>Woodland North Retaining Wall &amp; Site Renovations</td>
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<td>3611 NE 155th St. Lake Forest Park, WA 98155</td>
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<tr>
<td>Prime Contractor Phone Number</td>
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<td>Dollar Amount of Your Contract:</td>
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<tr>
<td>Date Work Completed: MM-DD-YYYY</td>
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### Project Completion

| Did your company hire any subcontractors? |
| Did your company have employees perform work on this project? |
| Did you use any apprentices on this job? (Apprentices are considered employees.) |

### Project Subcontractors

<table>
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<th>Company Name</th>
<th>Primary Contact</th>
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### Journey Level Wages

<table>
<thead>
<tr>
<th>County</th>
<th>Trade</th>
<th>Wage</th>
<th>Fringe</th>
<th># of Workers</th>
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### Apprentice Level Wages

<table>
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<th>County</th>
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<th>Wage %</th>
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Signature: __________________________________________________________

Print Name: _________________________________________________________

Date: _____________________________________________________________
This Contract is entered into by and between the Woodland North LLLP, hereinafter referred to as the “Owner” whose principal office is located at 600 Andover Park West, Seattle, WA 98188 and [Contractor], referred to as the “Contractor”, whose principal office is located at [Contractor's Address].

IN CONSIDERATION OF the mutual benefits and conditions hereinafter contained, the parties hereto agree as follows:

1.1 Contract Documents

A. The provisions set forth in the Contract Documents are hereby incorporated into and made part of the Contract. Contractor acknowledges receipt and review of all Contract Documents applicable to performance of the work. The Contract shall consist of the following component parts:

1. This Instrument
2. Addenda
3. Specifications
4. Plans
5. Bid Form
6. Pre-Bid Agenda
7. General Conditions
8. Instructions to Bidders
9. Wage Rates
10. Agreement to Pay Prevailing Wage
11. Performance and Payment Bond
12. Hazardous Materials Reports

1.2 Scope of Services to be Performed by the Contractor: The Contractor shall provide all labor, materials, tools, equipment, transportation, supplies, and incidentals required to complete the work in accordance with the Contract Documents for:

Project: Woodland North Retaining Wall & Site Renovations
Contract No.: TC2004231

1.3 Compensation:

Base Bid - $
10% Washington State Retail Sales Tax - $
Total amount of the Contract shall be dollars and cents ($ ) subject to additions and deductions provided therein.

1.4 Duration of Contract: The Contractor shall commence work after receipt of Notice to Proceed, follow the schedule specified in the contract documents, and all work must be completed within one hundred and eighty (180) consecutive calendar days, as indicated in the Specifications, from the date of the Notice to Proceed unless sooner terminated pursuant to the General Conditions. Upon expiration of the original Contract term, the Contract, at the Owner's sole discretion, may be extended for a period determined by the Owner.

1.5 Liquidated Damages: Timely performance and completion of the Work is essential to Owner and time limits stated in the Contract Documents are of the essence. If Completion of the Work does not occur within the Contract Time, the Contractor agrees that Liquidated Damages in the amounts stated in the Bid Documents will be assessed for each calendar day that the Contractor exceeds the time for completion.

The individuals signing this Contract warrant and represent for themselves and for their respective organizations that they are duly authorized to sign this Contract and that upon such signing their respective organizations are bound thereby.

DATED this day of , 2020

Contractor
Owner

President/Owner

Stephen Norman
Executive Director, KCHA
Its General Partner
CERTIFICATE OF INSURANCE

PRODUCER
Vendor’s Insurance Agent
Street Address
City, State, Zip
Phone Number

INSURED
Vendor Name
Street Address
City, State, Zip

COMPANIES AFFORDING COVERAGE

<table>
<thead>
<tr>
<th>COMPANY</th>
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<tbody>
<tr>
<td>A</td>
<td>ABC Insurance Company</td>
</tr>
<tr>
<td>B</td>
<td>DEF Insurance Company</td>
</tr>
<tr>
<td>C</td>
<td>GHI Insurance Company</td>
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COVERAGES

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND
CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS
CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE
AFFORDED BY THE POLICIES BELOW.

<table>
<thead>
<tr>
<th>LTR</th>
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<th>POLICY NUMBER</th>
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<td>THE PROPRIETOR/ PARTNERS/EXECUTIVE OFFICERS ARE: INCL EXCL</td>
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DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS

Allied Residential; King County Housing Authority; Woodland North LLP; BCP/Woodland North, LLC; Boston Capital Affordable Housing Fund V, LLC; and BCCC, LLC ISAOA are named as additional insureds with respect to above general liability and auto coverages.

Re: Insured’s work/services provided at Woodland North Apartments, 3611 NE 155th St, Lake Forest Park, WA 98155

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO MAIL SUCH NOTICE SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE COMPANY, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE
Signature of Insured’s Agent

ACORD CORPORATION 1993
PROVIDE

GENERAL LIABILITY ENDORSEMENT

and

AUTO LIABILITY ENDORSEMENT
SECTION 01 56 39 - TREE AND SHRUB PRESERVATION

PART 1 – GENERAL

1.1 SUMMARY

A. The scope of work includes all labor, materials, tools, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with protection of existing trees and other plants as shown on the drawings and as specified herein.

1. Provide tree protection fencing.
2. Provide protection of root zones and above ground tree.
3. Provide pruning of existing trees and shrubs.
4. Coordinate with the requirements of Section Planting Soil for modifications to the soil within the root zone of existing trees.
5. Provide all insect and disease control.
6. Provide maintenance of existing trees and shrubs including irrigation during the construction period.
7. Provide maintenance of existing trees including irrigation during the post construction plant maintenance period.
8. Remove tree protection fencing and other protection from around and under trees.
9. Clean up and disposal of all excess and surplus material.

1.2 CONTRACT DOCUMENTS

A. Shall consist of specifications and general conditions and the drawings. The intent of these documents is to include all labor, materials, and services necessary for the proper execution of the work. The documents are to be considered as one. Whatever is called for by any parts shall be as binding as if called for in all parts.

B. It is the intent of this section that the requirements apply to all sections of the project specification such that any subcontractor must comply with the restrictions on work within designated Tree and Shrub Protection Areas.

1.3 RELATED DOCUMENTS AND REFERENCES

A. Related Documents:

1. Drawings and general provisions of contract including general and supplementary conditions and Division I specifications apply to work of this section.
2. Section 32 91 13 – Soil Preparation
3. Section 32 84 00 – Planting Irrigation
4. Section 32 93 00 – Plants
5. Section 32 92 23 – Turf and Grasses

B. References: The following specifications and standards of the organizations and
documents listed in this paragraph form a part of the specification to the extent required
by the references thereto. In the event that the requirements of the following referenced
standards and specification conflict with this specification section the requirements of
this specification shall prevail. In the event that the requirements of any of the following
referenced standards and specifications conflict with each other the more stringent
requirement shall prevail.

1. City of Lake Forest Park Urban Forest Manual, City of Lake Forest Park Planning and
   Development Services/ Environmental Services, most current edition.
2. ANSI A 300 (Part 5) – Standard Practices for Tree, Shrub and other Woody Plant
   Maintenance, most current editions.
3. Glossary of Arboricultural Terms, International Society of Arboriculture, Champaign Il,
   most current edition.

1.4 VERIFICATION

A. All scaled dimensions on the drawings are approximate. Before proceeding with any
work, the Contractor shall carefully check and verify all dimensions and quantities, and
shall immediately inform the Owner’s Representative of any discrepancies between the
information on the drawings and the actual conditions, refraining from doing any work
in said areas until given approval to do so by the Owner’s Representative.

1.5 PERMITS AND REGULATIONS

A. The Contractor shall obtain and pay for all permits related to this section of the work
unless previously excluded under provision of the contract or general conditions. The
Contractor shall comply with all laws and ordinances bearing on the operation or
conduct of the work as drawn and specified. If the Contractor observes that a conflict
exists between permit requirements and the work outlined in the contract documents,
the Contractor shall promptly notify the Owner’s Representative in writing including a
description of any necessary changes and changes to the contract price resulting from
changes in the work.

B. Wherever references are made to standards or codes in accordance with which work is
to be performed or tested, the edition or revision of the standards and codes current on
the effective date of this contract shall apply, unless otherwise expressly set forth.

C. In case of conflict among any referenced standards or codes or between any referenced
standards and codes and the specifications, the more restrictive standard shall apply, or Owner’s Representative shall determine which shall govern.

1.6 PROTECTION OF WORK, PROPERTY AND PERSON

A. The Contractor shall protect the work, adjacent property, and the public, and shall be responsible for any damages or injury due to his/her actions.

1.7 CHANGES IN THE WORK

A. The Owner’s Representative may order changes in the work, and the contract sum should be adjusted accordingly. All such orders and adjustments plus claims by the Contractor for extra compensation must be made and approved in writing before executing the work involved.

1.8 CORRECTION OF WORK

A. The Contractor shall re-execute any work that fails to conform to the requirements of the contract and shall remedy defects due to faulty materials or workmanship upon written notice from the Owner’s Representative, at the soonest possible time that can be coordinated with other work and seasonal weather demands.

1.9 DEFINITIONS

All terms in this specification shall be as defined in the “Glossary of Arboricultural Terms” or as modified below.

A. Owner’s Representative: The person appointed by the Owner to represent their interest in the review and approval of the work and to serve as the contracting authority with the Contractor. The Owner’s Representative may appoint other persons to review and approve any aspects of the work.

B. Reasonable and reasonably: When used in this specification is intended to mean that the conditions cited will not affect the establishment or long-term stability, health or growth of the plant. This specification recognizes that plants are not free of defects, and that plant conditions change with time. This specification also recognizes that some decisions cannot be totally based on measured findings and that profession judgment is required. In cases of differing opinion, the Owner’s Representative expert shall determine when conditions within the plant are judged as reasonable.

C. Tree and Shrub Protection Area: Area surrounding individual trees or groups of trees to be protected during construction and defined by a circle centered on the trunk with each tree with a radius equal to the clown dripline unless otherwise indicated by the owner’s representative.

D. Tree: Single and multi-stemmed plants, including palms with anticipated mature height
approximately greater than 25 feet or any plant identified on the plans as a tree.

1.10 SUBMITTALS

A. PRODUCT DATA: Submit manufacturer product data and literature describing all products required by this section to the Owner’s Representative for approval. Provide submittal four weeks before the start of any work at the site.

B. QUALIFICATIONS SUBMITTAL: For each applicable person expected to work on the project, provide copies of the qualifications and experience of the Consulting arborist, proof of either the registered Consulting Arborist® (RCA) with American Society of Consulting Arborists or an ISA Board Certified Master Arborist and any required Herbicide/Pesticide license to the Owner’s Representative, for review prior to the start of work.

1.11 OBSERVATION OF THE WORK

A. The Owner’s Representative may inspect the work at any time.

1.12 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction meeting with the Owner’s Representative at least seven (7) days before beginning work to review any questions the Contractor may have regarding the work, administrative procedures during construction and project work schedule.

1. The following Contractors shall attend the preconstruction conference:
   a. General Contractor.
   b. Consulting Arborist.
   c. Subcontractor assigned to install Tree Protection measures.
   d. Earthwork Contractor.
   e. All site utility Contractors that may be required to dig or trench into the soil.
   f. Landscape subcontractor.
   g. Irrigation subcontractor

B. Prior to this meeting, mark all trees to remain and or be removed as described in this specification for review and approval by the Owner's Representative.

1.13 QUALITY ASSURANCE

A. Contractor qualifications:

1. All pruning, branch tie back, tree removal, root pruning, and fertilizing required by this section shall be performed by or under the direct supervision of ISA Certified Arborist Submit aforementioned individual’s qualifications for approval by the Owner’s Representative.

2. All applications of pesticide or herbicide shall be performed by a person maintaining a current state license to apply chemical pesticides valid in the jurisdiction of the project. Submit copies of all required state licensing certificates including applicable chemical applicator licenses.
PART 2 – PRODUCTS

2.1 MULCH

A. Mulch shall be coarse, ground, from tree and woody brush sources. The minimum range of fine particles shall be 3/8 inch or less in size and a maximum size of individual pieces shall be approximately 1 to 1-1/2 inch in diameter and maximum length of approximately 4 to 8 inches. No more that 25% of the total volume shall be fine particles and no more than 20% of total volume be large pieces.

1. It is understood that Mulch quality will vary significantly from supplier to supplier and region to region. The above requirements may be modified to conform to the source material from locally reliable suppliers as approved by the Owner’s Representative.

B. Submit supplier’s product data that product meets the requirements and two-gallon sample for approval.

2.2 WOOD CHIPS:

A. Wood Chips from an arborist chipping operation with less than 20% by volume green leaves. Chips stockpiled from the tree removal process may be used.

2.3 TREE AND SHRUB PROTECTION FENCING:

A. Snow Fence per Plans and Details.

B. Submit supplier’s product data that product meets the requirements for approval.

2.4 TREE PROTECTION SIGN:

A. Per City of Seattle as shown in Contract Documents

2.5 MATTING

A. Matting for vehicle and work protection shall be heavy duty matting designed for vehicle loading over tree roots, Alturnamats as manufactured by Alturnamats, Inc. Franklin, PA 16323 or approved equal.

B. Submit supplier’s product data that product meets the requirements for approval.

2.6 GEOGRID

A. Geogrid shall be woven polyester fabric with PVC coating, Uni-axial or biaxial geogrid, inert to biological degradation, resistant to naturally occurring chemicals, alkalis, acids.

1. Geogrid shall be Miragrid 2XT as manufactured by Ten Cate Nicolon, Norcross, GA. http://www.tencate.com or approved equal.
B. Submit supplier’s product data that product meets the requirements for approval.

2.7 FILTER FABRIC

A. Filter Fabric shall be nonwoven polypropylene fibers, inert to biological degradation and resistant of naturally occurring chemicals, alkalis and acids.

1. Mirafi 135 N as manufactured by Ten Cate Nicolon, Norcross, GA. [http://www.tencate.com](http://www.tencate.com) or approved equal.

B. Submit supplier’s product data that product meets the requirements for approval.

PART 3 – EXECUTION

3.1 SITE EXAMINATION

A. Examine the site, tree, plant and soil conditions. Notify the Owner’s Representative in writing of any conditions that may impact the successful Tree Protections that is the intent of this section.

3.2 COORDINATION WITH PROJECT WORK

A. The Contractor shall coordinate with all other work that may impact the completion of the work.

B. Prior to the start of Work, prepare a detailed schedule of the work for coordination with other trades.

C. Coordinate the relocation of any irrigation lines currently present on the irrigation plan, heads or the conduits of other utility lines or structures that are in conflict with tree locations. Root balls shall not be altered to fit around lines. Notify the Owner’s Representative of any conflicts encountered.

3.3 TREE PROTECTION AREA

A. The Tree Protection Area is defined as all areas indicated on the tree protection plan. Where no limit of the Tree Protection area is defined on the drawings, the limit shall be the drip line (outer edge of the branch crown) of each tree.

3.4 PREPARATION:

A. Prior to the preconstruction meeting, layout the limits of the Tree Protection Area and then alignments of required Tree Protection Fencing and root pruning. Obtain the Owner’s Representative's approval of the limits of the protection area and the alignment of all fencing and root pruning.
B. Flag all trees and shrubs to be removed by wrapping orange plastic ribbon around the trunk and obtain the Owner’s Representative's approval of all trees and shrubs to be removed prior to the start of tree and shrub removal. After approval, mark all trees and shrubs to be removed with orange paint in a band completely around the base of the tree 4.5 feet above the ground.

C. Flag all trees and shrubs to remain with white plastic ribbon tied completely around the trunk or each tree and on a prominent branch for each shrub. Obtain the Owner’s Representative's approval of all trees and shrubs to be remain prior to the start of tree and shrub removal.

D. Prior to any construction activity at the site including utility work, grading, storage of materials, or installation of temporary construction facilities, install all tree protection fencing, Filter Fabric, silt fence, tree protection signs, Geogrid, Mulch and or Wood Chips as shown on the drawings.

3.5 SOIL MOISTURE

A. Volumetric soil moisture level, in all soils within the Tree Protection Area shall be maintained above permanent wilt point to a depth of at least 8 inches. No soil work or other activity shall be permitted within the Tree Protection Area when the volumetric soil moisture is above field capacity. The permanent wilt point and field capacity for each type of soil texture shall be defined as follows (numbers indicate percentage volumetric soil moisture).

<table>
<thead>
<tr>
<th>Soil type</th>
<th>Permanent wilt point v/v</th>
<th>Field capacity v/v</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand, Loamy sand, Sandy loam</td>
<td>5-8%</td>
<td>12-18%</td>
</tr>
<tr>
<td>Loam, Sandy clay, Sandy clay loam</td>
<td>14-25%</td>
<td>27-36%</td>
</tr>
<tr>
<td>Clay loam, Silt loam</td>
<td>11-22%</td>
<td>31-36%</td>
</tr>
<tr>
<td>Silty clay, Silty clay loam</td>
<td>22-27%</td>
<td>38-41%</td>
</tr>
</tbody>
</table>

1. Volumetric soil moisture shall be measured with a digital, electric conductivity meter. The meter shall be the Digital Soil Moisture Meter, DSMM500 by General Specialty Tools and Instruments, or approved equivalent meter.

B. The Contractor shall confirm the soil moisture levels with a moisture meter. If the moisture is too high, suspend operations until the soil moisture drains to below field capacity.

3.6 ROOT PRUNING:

A. Prior to any excavating into the existing soil grade within 25 feet of the limit of the Tree Protection Area or trees to remain, root prune all existing trees to a depth of 24
inches below existing grade in alignments following the edges of the Tree Protection Area or as directed by the Owner’s Representative. Root pruning shall be in conformance with City of Seattle Urban Forestry Manual.

1. Using a rock saw, chain trencher or similar trenching device, make a vertical cut within 2 feet of the limit of grading.

3.7 INSTALLATION OF GEOGRIDS, FILTER FABRIC, MATTING, WOOD CHIPS AND OR MULCH

A. Install Geogrids, Filter Fabric, matting, Wood Chips and or Mulch in areas and depths shown on the plans and details or as directed by the Owner's representative. In general, it is the intent of this specification to provide the following levels of protection:

1. All areas within the Tree Protection area provide a minimum of 6 inches of Wood Chips or Mulch.

2. Areas where foot traffic or storage of lightweight materials is anticipated to be unavoidable provide a layer of Filter Fabric under the 6 inches of Wood Chips or Mulch.

3. Areas where occasional light vehicle traffic is anticipated to be unavoidable provide a layer of Geogrids under 8 inches of Wood Chips or Mulch.

4. Areas where heavy vehicle traffic is unavoidable provide a layer of Geogrids under 8 - 12 inches of Wood Chips or Mulch and a layer of matting over the Wood Chips or Mulch.

B. The Owner's Representative shall approve the appropriate level of protection.

C. In the above requirements, light vehicle is defined as a track skid steer with a ground pressure of 4 psi or lighter. A heavy vehicle is any vehicle with a tire or track pressure of greater than 4 psi. Lightweight materials are any packaged materials that can be physically moved by hand into the location. Bulk materials such as soil, or aggregate shall never be stored within the Tree and Shrub Protection Area.

3.8 PROTECTION:

A. Protect the Tree and Shrub Protection Area at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves and roots of all plants; and contamination of the soil, bark or leaves with construction materials, debris, silt, fuels, oils, and any chemicals substance. Notify the Owner’s Representative of any spills, compaction or damage and take corrective action immediately using methods approved by the Owner’s Representative.

3.9 GENERAL REQUIREMENTS AND LIMITATIONS FOR OPERATIONS WITHIN THE TREE AND SHRUB PROTECTION AREA:

A. The Contractor shall not engage in any construction activity within the Tree and Shrub Protection Area without the approval of the Owner's Representative including:
operating, moving or storing equipment; storing supplies or materials; locating temporary facilities including trailers or portable toilets and shall not permit employees to traverse the area to access adjacent areas of the project or use the area for lunch or any other work breaks. Permitted activity, if any, within the Tree and Shrub Protection Area maybe indicated on the drawings along with any required remedial activity as listed below.

B. In the event that construction activity is unavoidable within the Tree and Shrub Protection Area, notify the Owner’s Representative and submit a detailed written plan of action for approval. The plan shall be in conformance with City of Lake Forest Park Urban Forestry Manual.

3.10 TREE REMOVAL:

A. No Trees are to be removed unless directed by Owners Representative.

B. Remove trees that are adjacent to trees or structures to remain, in sections, to limit the opportunity of damage to adjacent crowns, trunks, ground plane elements and structures.

C. Do not drop trees with a single cut unless the tree will fall in an area not included in the Tree and Shrub Protection Area. No tree to be removed within 50 feet of the Tree and Shrub Protection Area shall be pushed over or uprooted using a piece of grading equipment.

D. Protect adjacent paving, soil, trees, shrubs, ground cover plantings and understory plants to remain from damage during all tree removal operations, and from construction operations. Protection shall include the root system, trunk, limbs, and crown from breakage or scarring, and the soil from compaction.

E. Remove existing stumps and immediate root plate from existing trees to be removed. Grind trunk bases and large buttress roots to a depth of the largest buttress root or at least 18 inches below the topmost roots whichever is less and over the area of three times the diameter of the trunk (DBH).

1. For trees where the stump will fall under new paved areas, grind roots to a total depth of 18 inches below the existing grade. If the sides of the stump hole still have greater than approximately 20% wood visible, continue grinding operation deeper and or wider until the resulting hole has less than 20% wood. Remove all wood chips produced by the grinding operation and back fill in 8-inch layers with controlled fill of a quality acceptable to the site engineer for fill material under structures, compacted to 95% of the maximum dry density standard proctor. The Owner’s Representative shall approve each hole at the end of the grinding operation.

2. In areas where the tree location is to be a planting bed or lawn, remove all woodchips and backfill stump holes with planting soil as defined in Specification Section Planting Soil,
in maximum of 12-inch layers and compact to 80 - 85% of the maximum dry density standard proctor.

3.11 PRUNING:

A. Within six months of the estimated date of substantial completion, prune all dead or hazardous branches larger than 2 inch in diameter from all trees to remain.

B. Implement all pruning recommendations found in the arborist report.

C. Prune any low, hanging branches and vines from existing trees and shrubs that overhang walks, streets and drives, or parking areas as follows:
   1. Walks - within 8 feet vertically of the proposed walk elevation.
   2. Parking areas - within 12 feet vertically of the proposed parking surface elevation.
   3. Streets and drives - within 14 feet vertically of the proposed driving surface elevation.

D. All tree pruning shall be in conformance with City of Seattle Urban Forestry Manual.

E. Perform other pruning task as indicated on the drawings or requested by the Owner's Representative.

F. Where tree specific disease vectors require, sterilize all pruning tools between the work in individual trees.

3.12 WATERING

A. The Contractor shall be fully responsible to ensure that adequate water is provided to all plants to be preserved during the entire construction period. Adequate water is defined to be maintaining soil moisture above the permanent wilt point to a depth of 8 inches or greater.

B. The Contractor shall adjust the automatic irrigation system, if available, and apply additional water, using hoses or water tanks as required.

C. Periodically test the moisture content in the soil within the root zone to determine the water content.

3.13 WEED REMOVAL

A. During the construction period, control any plants that seed in and around the fenced Tree and Shrub Protection area at least three times a year.
   1. All plants that are not shown on the planting plan or on the Tree and Shrub Protection Plan to remain shall be considered as weeds.
B. At the end of the construction period provide one final weeding of the Tree and Shrub Protection Area.

3.14 INSECT AND DISEASE CONTROL

A. Monitor all plants to remain for disease and insect infestations during the entire construction period. Provide all disease and insect control required to keep the plants in a healthy state using the principles of Integrated Plant Management (IPM). All pesticides shall be applied by a certified pesticide applicator.

3.15 CLEAN-UP

A. During Tree and Shrub protection work, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.

1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.

B. Once tree and shrub protection work is complete, wash all soil from pavements and other structures. Ensure that Mulch is confined to planting beds.

C. Make all repairs to grades, ruts, and damage to the work or other work at the site.

D. Remove and dispose of all excess Mulch, Wood Chips, packaging, and other material brought to the site by the Contractor.

3.16 REMOVAL OF FENCING AND OTHER TREE AND SHRUB PROTECTION

A. At the end of the construction period or when requested by the Owner’s Representative remove all fencing, Wood Chips or Mulch, Geogrids and Filter Fabric, trunk protection and or any other Tree Protection material.

3.17 DAMAGE OR LOSS TO EXISTING PLANTS TO REMAIN

A. Any trees or plants designated to remain, and which are damaged by the Contractor shall be replaced in kind by the Contractor at their own expense. Tree shall be replaced with a tree of similar species and of equal size or 6-inch caliper whichever is less. Shrubs shall be replaced with a plant of similar species and equal size or the largest size plants reasonably available which ever is less. Where replacement plants are to be less than the size of the plant that is damaged, the Owner’s Representative shall approve the size and quality of the replacement plant.

1. All trees shall be installed per the requirements of Specification Section Planting.
B. Plants that are damaged shall be considered as requiring replacement or appraisal in the event that the damage affects more than 25% of the crown, 25% of the trunk circumference, or root protection area, or the tree is damaged in such a manner that the tree could develop into a potential hazard. Trees and shrubs to be replaced shall be removed by the Contractor at his own expense.

2. The Owner's Representative may engage an independent arborist to assess any tree or plant that appears to have been damaged to determine their health or condition.

C. Any tree that is determined to be dead, damaged or potentially hazardous by the Owner's arborist and upon the request of the Owner's Representative shall be immediately removed by the Contractor at no additional expense to the owner. Tree removal shall include all clean up of all wood parts and grinding of the stump to a depth sufficient to plant the replacement tree or plant, removal of all chips from the stump site and filling the resulting hole with topsoil.

D. Any remedial work on damaged existing plants recommended by the consulting arborist shall be completed by the Contractor at no cost to the owner. Remedial work shall include but is not limited to soil compaction remediation and vertical mulching, pruning and or cabling, insect and disease control including injections, compensatory watering, and additional mulching.

E. Remedial work may extend up to two years following the completion of construction to allow for any requirements of multiple applications or the need to undertake applications at required seasons of the year.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Selective demolition and removal of building and site elements as indicated on drawings.
      2. Protect existing building and site elements scheduled to remain during demolition activities and while new work is being installed.

1.2 RELATED SECTIONS:
   A. Division 0 and 1 Requirements apply

1.3 REFERENCES

1.4 SUBMITTALS
   A. See KCHA division 0 and 01 for Project Administration. Refer to BID PACKAGE for these GENERAL REQUIREMENTS.
   B. Schedule: Submit for approval selective demolition schedule, including schedule for any interruption of utility service to affected units.
   C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
      1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
      2. Identify demolition firm and submit qualifications.
      3. Include a summary of safety procedures.
      4. Indicate protection and separation of occupied premises.
      5. Continuity of site utilities: Underground utilities, including water, telephone, data, cable television, gas must remain in full operation during the work.
   D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.
   E. Schedule of demolition activities to be updated at each scheduled construction meeting.
      1. Indicate detailed sequence of demolition and removal work with starting and ending dates for each activity.
      2. Indicate any interruption of services.
      3. Indicate locations of temporary protection from the work and means of egress from the building.

1.5 QUALITY ASSURANCE
   A. Codes and Regulations: Comply with governing codes and regulations. Use experienced workers. Maintain watertight integrity as needed to protect construction to remain from structural and environmental damage.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Comply with Section 016000
1.7 PROJECT CONDITIONS
A. Building to be selectively demolished will remain fully occupied during the construction sequence.
Isolating work areas to limit dust, dirt, noise and debris is critically important during the construction
process.
B. Protection of Existing Improvements: Provide, erect and maintain barricades, coverings, or other types
of protection necessary to prevent damage to existing improvements. Restore any site improvements,
including but not limited to landscaping, pavement, walks, structures, fences and planters, damaged by
this work to their original condition, as acceptable to Owner.
C. Existing Conditions: Refer to construction drawing sets for each site for information. No
responsibility for portions of building to be demolished will be assumed by the Owner.

PART 2 PRODUCTS

2.1 DEMOLITION APPLICATIONS
A. To Contractor: All other salvage becomes property of the Contractor.
B. Selective Building Demolition:
   1. Demolition of specified building and site elements and as indicated on drawings.
   2. Protection of portions of building adjacent to or affected by selective demolition.
   3. Notification to Owner of schedule of shut-off of utilities which serve occupied spaces.
   4. Pollution control during selective demolition.
   5. Removal and legal disposal of materials.
   6. Protection of existing site improvements and adjacent construction.
   7. Utilities: Interruption, capping or removal as applicable.

PART 3 EXECUTION

3.1 SCOPE
A. Remove portions of existing buildings as indicated on the drawings.
B. Do not damage building elements and improvements indicated to remain. Items of salvage value, not
   included on schedule of salvage items to be returned to Owner, shall be removed from the site.
   Storage or sale of items at project site is prohibited.
C. Occupied Spaces: Do not close or obstruct streets, walks, drives or other occupied or used spaces or
   facilities without the written permission of the Owner and the authorities having jurisdiction. Do not
   interrupt utilities serving occupied or used facilities without the written permission of the Owner;
   Owner requires minimum ninety-six (96) hours’ notice of any utility shutoffs affecting non-remodeled
   units or common spaces. Email notice to Owner’s Project Manager is acceptable as official “written
   notice”.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS
A. Comply with applicable codes and regulations for demolition operations and safety of adjacent
   structures and the public.
   1. Refer to KCHA Division 0 and 1 for Construction Waste Management and Disposal for
      additional requirements.
   2. Obtain required permits.
   3. Comply with applicable requirements of NFPA 241.
   4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do
      not allow worker or public access within range of potential collapse of unstable structures.
   5. Provide, erect and maintain temporary barriers and security devices.
   6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
8. Do not close or obstruct roadways or sidewalks without permit.
9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

D. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

E. If hazardous materials are discovered during removal operations, stop work and notify the Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

F. Perform demolition in a manner that maximizes salvage and recycling of materials.

3.3 EXISTING UTILITIES
A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least seven (7) days’ prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least three (3) days’ prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports and foundations of disconnected and abandoned utilities.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS
A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Owner before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions.

B. Separate areas in which demolition is being conducted from other areas that are still occupied
   1. Provide, erect and maintain temporary dustproof partitions of construction indicated on drawings in locations of work.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.

E. Services (including but not limited to HVAC, Plumbing, Fire Protection, Electrical and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

3.5 DEBRIS AND WASTE REMOVAL
A. Remove debris, junk and trash from site. Do not allow demolished materials to accumulate on site. See KCHA Division 0 and 1 Project Administration for compliance with Waste Management requirements and procedures. Refer to BID PACKAGE for these GENERAL REQUIREMENTS.

B. Remove from site all materials not to be reused on site.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

3.6 SCHEDULE
A. Items for Protection during Demolition and Construction:
   1. Common spaces and exterior walkways, including entryways.
   2. Adjacent construction.
   3. As required.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
A. Section Includes: Reinforcing steel and accessories for concrete reinforcement.
B. Related Requirements:
   1. Section 033000 - Cast-In-Place Concrete

1.2 REFERENCES
A. Reference Standards: Conform to provision of Sheet A0.1 – General Requirements. B.
   American Concrete Institute (ACI):
   2. ACI 318 - Building Code Requirements for Reinforced Concrete.
   3. ACI SP-66 - ACI Detailing Manual (ACI 315 and ACI 315R)
C. ASTM International (ASTM):
   1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
   2. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
   3. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
   5. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   6. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed Bars and Plain Bars for Concrete Reinforcement.
   7. ASTM A722 - Standard Specification for Uncoated High-Strength Steel Bars for Prestressing Concrete.
D. American Welding Society (AWS): AWS D 1.4 - Structural Welding Code - Reinforcing Steel. E.

1.3 ADMINISTRATIVE REQUIREMENTS
A. Coordination: Conform to Plan sheet T1.1 – General Requirements for coordination with work of other Sections.

1.4 SUBMITTALS
A. Submit in accordance with Plan Sheet T1.1 – General Requirements and Division 1 – General Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Comply with Plan Sheet A0.1 – General Requirements and Division 1 Section 015000 Temporary facility and controls.
B. Deliver reinforcement to site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.
C. Store and protect concrete reinforcement materials at site from damage, dirt and rust.
PART 2 PRODUCTS

2.1 REQUIREMENTS
A. Conform to requirements listed on Plan Sheet T1.1 – General Requirements for referenced Codes, ordinances, and other regulatory requirements.
B. Special Inspections: Conform to requirements of IBC Chapter 17 – Structural Tests and Special Inspections

2.2 PERFORMANCE / DESIGN CRITERIA
A. Supply reinforcing steel in predetermined sizes and bends to eliminate field alterations. Do not make alterations to shop formed steel without prior acceptance for each instance by Owner or Owner’s Representative.

2.3 REINFORCEMENT
A. Type, Size and Location: In accordance with Structural Notes and Drawings.
B. Reinforcing Steel: Deformed bar, free from rust, dirt, and loose scale, uncoated. Factory mark with size and grade.
1. Billet-Steel Reinforcing Bar: ASTM A615, Grade 60 (60 ksi yield strength).
C. Welded Steel Wire Fabric: Conform to IBC Chapter 3, including ASTM A185 Plain Type or ASTM A497 Deformed Type, uncoated or galvanized, free from rust, dirt, and loose scale.

2.4 FABRICATION
A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice and ACI 318.
B. Reinforcing Bars Bend Dimensions and Fabrication Tolerances: Conform to IBC Chapter 19 and ACI 318, except as otherwise shown on Structural Drawings.

2.5 ACCESSORIES
A. Deformed Bar Anchors (DBA): Welded deformed bar stud anchors for concrete connections. Manufacture for automatic stud welding, as instructed by manufacturer. Provide appropriate ferrule for each stud.
2. Cold-rolled Deformed Steel Wire: ASTM A496.
3. Manually Welded Normal Reinforcing Bars: Not accepted in place of DBA.
B. Mechanical Splices:
2. Conform to ACI 318 Section 12.14.3 and ACI 318 Section 21.2.6, as modified by IBC Chapter 19, and as specified or shown on Structural Drawings.
3. Type 1 Splice: Develop minimum 125 percent of specified yield strength (fy) of rebar as required for tension or compression.
4. Type 2 Splice: Develop 100 percent of the specified tensile strength, (fu) of rebar, and 125 \[160\] percent of the specified yield strength, fy, of rebar.
5. Tie Wire: No. 16 gage or heavier double annealed iron wire.
C. Chairs, Bolsters, Bar Supports, Spacers:
1. Detail in conformance to ACI SP-66 and CRSI Bar Support Classifications.
2. Design sizes and shapes as required to maintain strength and support of reinforcement during placement of concrete.
3. Include load bearing pads to prevent vapor retarder puncture.

D. Special Chairs, Bolsters, Bar Supports, and Spacers Adjacent to Weather-Exposed Concrete Surfaces: Plastic-coated steel or stainless steel type; size, and shape as required for Project conditions.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean reinforcing steel of loose rust, mud, dirt, debris, oil, and other foreign substances that may affect bond.
B. Verify below grade vapor retarder complete, unbroken, and sealed at overlaps, transitions, and penetrations.

3.2 INSTALLATION

A. Placement of Reinforcing Steel and Tolerances: Conform to IBC Chapter 19 and referenced ACI 318, and ACI 117.
B. Details of Placement and Support of Reinforcing Steel: Conform to ACI SP-66 and CRSI recommendations, as shown on accepted placement drawing submittals.
C. Displacement of Reinforcing: Where displaced, shifted, or moved to locations exceeding allowable tolerances, prior to placing concrete:
   1. Provide 48 hours notice to Owner or Owner’s Representative.
   2. Obtain acceptance for resulting arrangement.
D. Joints: Place reinforcement through expansion joints and as specified or shown on Drawings through construction and contraction joints.
E. Allowable Cover over Reinforcement: Conform to IBC Chapter 19 and as shown on Structural Drawings. Where not shown, provide minimum 3 inch cover.
F. Tie Wires: Bend or turn as necessary to prevent exposure of wires through concrete placement. G. Welded Wire Fabric:
   1. Place continuously where shown in slabs between control and expansion joints.
   2. Do not carry through expansion joints.
   3. Cut 1/2 of fabric through control joints, except as otherwise shown on Drawings
   4. Extend across beams and walls.
   5. Lap fabric minimum 8 inch on sides and ends.
H. Dowels:
   1. Install at right angle to joint being doweled.
   2. Accurately align dowels parallel to finished concrete surface.
   3. Rigidly support during concrete placement using dowel baskets.
   4. Coat one end of dowel with bond breaker.
I. Lapped Bars: Place in contact and tie securely, or space transversely apart to embed entire surface of bar into concrete. Do not space lapped bars more than 1/5th required length of lap and no more than 6 inch apart.
J. Splices: Conform to ACI 318 as modified by IBC Chapter 19 and Structural Drawings.
K. Vapor Barrier: Do not puncture or displace. Do not use grade stakes or other accessories that may puncture vapor barrier.

3.3 Formed Openings: Place reinforcing steel to accommodate openings and penetrations.
A. Soil at Footings: Maintain firm and compacted during placement of reinforcing steel.
B. Do not drive nails in forms for supporting steel.
C. Stubs and Other Projecting Bars: Place and secure before pouring.
D. Field Bending Reinforcing Steel: Not permitted, except as accepted by Owner or Owner’s Representative.
E. Torch Cutting: Do not use gas cutting torches in field for correcting fabrication errors in reinforcing steel, except as accepted by Owner or Owner’s Representative.
F. Reinforcing Conflict with Other Construction: Notify Owner or Owner’s Representative prior to placing concrete. Includes in conflict with conduit, piping, inserts, and sleeves.
G. Field Welding of Reinforcement: Not permitted.

3.4 FIELD QUALITY CONTROL
A. Conform to independent inspections as required by AHJ.
B. Inspect for acceptability before beginning concrete work of Related Sections.

3.5 ADJUSTING
A. Defective Reinforcing: Remove and replace:
   1. Bars with kinks or bends not shown on Drawings.
   2. Bars damaged due to bending or straightening.
   3. Bars heated for bending.
   4. Reinforcing steel not placed in accordance with provisions of Contract Documents.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Cast-in-place concrete for building slabs
   2. Cast-in-place concrete for exterior site concrete
B. Related Requirements:
   1. Section 032100 - Reinforcing Steel

1.2 DEFINITIONS
A. Slump: The measurement of the vertical difference in height of the resulting concrete pile and the original 12 inch tall cone after the slump cone is filled then lifted.
B. Slump Flow: The measurement of the resulting horizontal diameter of the concrete pile after the slump cone is filled then lifted. This method measures the unconfined flow of the mixture.

1.3 REFERENCES
A. Reference Standards: Conform to provision of Sheet A0.1 – General Requirements
B. American Concrete Institute (ACI):
   1. 117 - Standard Tolerances for Concrete Construction and Materials.
   2. 301-305 - Specifications for Structural Concrete.
   3. 315 - Details and Detailing of Concrete Reinforcement.
C. ASTM International (ASTM):
   1. C615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
   2. C33 - Specification for Concrete Aggregates.
   4. C132 - Test for Slump of Portland Cement Concrete
   8. C260 - Specification for Air-Entraining Admixtures for Concrete
   11. C618 - Specifications for Coal Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
   16. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
1.4 ACTION SUBMITTALS
   A. Submit in accordance with Division 1 Section 013300.
   B. Mix Designs: Sign by batch plant quality control engineer or responsible agent for each design.
      Include for each mix design:
      1. Method and test data used to establish mix proportions.
         a. Include supporting test records for field experience method or trial batch method for each mix
core.
         b. Include date of test and batch plant location.
      2. Concrete compressive strength.
      3. Water/cement ratios with corresponding cement content and water content.
      4. Linear shrinkage. Mix designs with no test data may substitute shrinkage reducing admixture in
         proportions conforming to manufacturer’s instructions.
      5. Aggregates, including types, pit or quarry locations, producer names, grading, specific gravities,
         certification, and evidence of conformance to this specification.
         a. Base aggregate weights on saturated surface dry conditions.
         b. Include concrete mix gradations of coarse to fine aggregates.
      6. Concrete compressive strength at 7, 28, and 56 day strengths
      7. Admixtures and additives.
      8. Chloride ion content.
     10. Slump or slump flow.
     11. Hot and cold weather designs.
     12. Air entrainment at exterior slabs.
     13. Ingredients, proportions, and source of materials.
     14. Locations and intended use.
   C. Product Data: Submit manufacturer's printed data and instructions for proprietary products and equipment,
      including for:
      1. Admixtures and additives.
      2. Fiber reinforcing.
      4. Screeding products and equipment.
      5. Hardener densifiers.
      7. Contraction joints, isolation joints, construction joints, and cold joints.

1.5 INFORMATIONAL SUBMITTALS
   A. Submit in accordance with Plan Sheet T1.1 – General Requirements and Division 1 – General Requirements.

1.6 QUALITY ASSURANCE
   A. Conform to Quality Assurance provisions of Plan Sheet T1.1 – General Requirements and Division 1 Section
      014000
   B. Exposed Concrete: Conform to ACI 301, Section 6 and ACI 303R for Architectural Concrete at exposed-
      to-view exterior surfaces in public areas.
   C. Concrete Producer Qualifications:
      1. Company specializing in manufacturing ready-mixed concrete products conforming to
         ASTM C94.
   D. Installer Qualifications:
1. Company specializing in work of this Section.
2. Able to show minimum 5 year documented experience in successful commercial quality work of comparable scope and quality when requested by Architect.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Conform to provisions of Plan Sheet T1.1 – General Requirements and manufacturer's instructions.
B. Mixing and Delivery: Conform to ASTM C94.
D. Batch Tickets: Accompany with each load, fully executed, and signed by authorized batch plant representative. Log in with inspector at time of entry. Conform to Source Quality Control requirements specified by this Section.
   1. Information: Conform to ASTM C94, Option A or C. Include additional batch ticket information to that required by ASTM C94.
      a. Concrete mix design.
      b. Water content and water withheld at batch plant.
      c. Time to nearest minute that batch was dispatched from plant, when it arrived at site, and when unloading began and was finished.
      d. Ambient air temperature and concrete internal temperature at time of arrival.
      e. Written record of water and other additives added to design mix following time that mix truck has left batch plant.
   2. Truck loads not accompanied with batch tickets will be rejected.
E. Elapsed Time From Start of Batching at Plant to Discharge at Project Site: Conform to following except where set-reducing admixtures are added by batch plant for hauls requiring longer time periods
   1. Maximum 90 minutes and maximum 300 revolutions, whichever comes first, following introduction of mix water.
   2. Air Temperatures:
      a. Reduce mixing and delivery time to maximum 75 minutes for between 85 degrees F and 90 degrees F.
      b. Reduce mixing and delivery time to 60 minutes for temperature above 90 Degrees F.
      c. Monitor concrete in truck and reject if temperature rises to 89 degrees or 5 degrees F in 10 minutes, indicating that concrete is setting up prior to discharge.
F. Reject concrete that has reached internal temperature of 89 degree F or above and when temperature has risen 5 degrees in 10 minutes, indicating that concrete is setting up prior to discharge.

1.8 FIELD CONDITIONS
A. Ambient Conditions: Conform to ACI 301, 5.3.2 for placement of concrete weather considerations. Do not place concrete during falling rain, sleet, or snow.

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. Substitution Requests to Specified Products: Conform to provisions of Division 1 – General Requirements.

2.2 REGULATORY REQUIREMENTS
A. Conform to Regulatory Requirements specified by Division 1 – General Requirements.
B. Testing and Special Inspections: Conduct testing under provisions of Division 1 – General
Requirements.
1. Conform to provisions of IBC Chapter 17, reference standards specified by ACI 318, procedures specified by ACI 301
2. Conform to ASTM C31, ASTM C39, and ASTM C143

C. Batch Tickets: Retain record of concrete delivered and placed on site.
1. Include exact mix proportions, slumps, test strength, date, time, location of placement, weather conditions at time of placement, and source of concrete.
2. Submit copies to Owner.

2.3 PERFORMANCE / DESIGN CRITERIA
A. Do not change brands and sources of cement, aggregates, admixtures, and additives during course of construction, except as accepted by Architect.
B. Supply mix design from same batch plant, using same source for mix ingredients, as submitted for supporting test data.
C. Performance Mix Design:
1. As basis for acceptance, submit new mix design from batch plant indicating that shrinkage, cracking, strength, and other properties are compatible with original mix design.
2. Prepare mix design for each type and strength of concrete by either laboratory trial batch, verified by independent testing laboratory, or field experience methods as prescribed by ACI 301.
3. Prepare mix design information for concrete batch weights with bulk-specific gravity determinations for aggregates based on saturated surface dry (SSD) condition. Include mix information sufficient to verify through absolute volume calculations:
   a. Concrete Yield.
   b. Cement Factor.
   c. Water/Cement Ratio.
   d. Mortar to Voids Ratio.
4. When adjustment to mix design becomes necessary due to job conditions, weather, test results, changes in material properties, or other circumstances, resubmit new mix design for acceptance by Architect.

D. Proportioning and Mixing: Conform to requirements of IBC, including Chapter 19.
E. Design Strength:
1. Interior Concrete Slabs: Minimum 4,000 psi 28 day strength and as shown on Drawings by General Structural Notes.
2. Exterior Site Work Concrete: Assume 4,000 psi, 28 day strength, except as otherwise specified or Shown on Drawings by Civil Site Paving and Grading Notes or General Structural Notes.

F. Water/Cement Ratio for Interior Slabs: 0.40 to 0.44, based on total cementitious material, including slag, fly ash and other pozzolanic materials.
1. Water Content for Slabs: Maximum 270 pounds per cubic yard.
2. Total Combined Cement and Fly Ash Content for Slabs: Minimum 516 pounds per cubic yard and as accepted by Architect.
3. Exterior Site Work Concrete: Assume 0.42 to 0.45 except as otherwise specified by Owner.

G. Length Change: Where no test data is available, add shrinkage reducing admixture, conforming to manufacturer’s instructions.
1. Slabs: Maximum 0.035 percent shrinkage in 28 days.

H. Superplasticizers: Add high range, mid-range, and low range water-reducing admixtures to batch plant mix as means to develop sufficient slump and workability, as instructed by manufacturer.
I. Air-Entraining Agents at Exterior Concrete:
   1. Achieve 5 percent entrained air, plus or minus 1-1/2 percent to batch plant concrete mix, for exterior concrete exposed to earth, weather, or freezing temperatures after curing.
   2. Do not add to interior slabs, except as accepted by Architect J.

Fly Ash and Slag:
   1. Add to batch plant concrete mix as Portland cement replacement. Submit back-up data for mix design.
   2. Slag and Fly ash content as a percentage of total weight of cementitious material:
      a. Concrete Slabs: Minimum 20 percent, maximum 25 percent.

K. Concrete Slump: Optimize through performance mix design by batch plant to suite placement conditions, as accepted for each mix design.

2.4 CONCRETE MATERIALS

A. Cement: ASTM C150.
   1. Interior: Type I and Type II. Do not use air-entrained concrete at interior slabs.
   2. Exterior: Type I with specified air entrainment admixture, preferred to Type IA and Type IIA air-entrained concrete. Type IIIA accepted for cold weather construction.

B. Aggregates:
   2. Coarse Aggregate Class Designation: As indicated by Table 3 for Type or Location of concrete for Moderate Weathering Region, including 5M for exterior Architectural Concrete.
   3. Size: Do not exceed 3/4 distance between reinforcing steel or 1/3 thickness of concrete slabs and toppings.
      a. Curbs, Sidewalks, Pavements and Slabs-on-Grade. Maximum 1 inch aggregate.
      b. Slabs and Structural Concrete: Maximum 3/4 inch aggregate.
   4. Free of deleterious substances that may cause expansion of concrete or react with alkalis in concrete.

C. Mix Water: ASTM C94, para. 5.1.3

D. Fly Ash: ASTM C618, Class F or Class C Pozzolan, loss on ignition not exceeding 1 percent.
   Account for lower calcium content of Class F where used.

2.5 CONCRETE ADMIXTURES, ADDITIVES, AGENTS, AND COMPOUNDS A.

   1. Euclid, Air Mix.
   2. Grace, Daravair 1000.
   3. BASF, AE 90 or Micro Air.
   4. Or approved.

B. Water Reducer Normal: ASTM C494, Type A
   1. Master Builders, Pozzolith/Polyheed.
   2. Euclid, Eucon WR 75
   3. Or approved

C. Superplasticizers / Water-reducing Admixtures.
   1. High range water-reducing admixture, ASTM C494, Type F or G and shall be of the second or third generation type. Shall be batch plant added, extend plasticity time, reduce water 20 to 30 percent.
      a. Euclid, Eucon 37.

D. Accelerator: ASTM C494, Type C or E, non-corrosive, non-chloride;
   1. Master Builders, Pozzutech 20.
   2. Euclid, Accelgard 90
   3. Or approved.

E. Set Retarder: ASTM C494, Type B.

F. Shrinkage Reducing Admixture (SRA): As tested to ASTM C157 and conforming to accepted test data for linear shrinkage as instructed by manufacturer.
   2. BASF, Tetraguard AS20 and Tetraguard PW.

2.6 ACCESSORIES

A. Bonding Agent: acrylic type;
   1. Sonneborn, Sonnocrete.
   2. W.R. Grace, Duraweld C.
   3. Euclid, Flex-con
   4. Or approved

B. Non-Shrink Grouts: ASTM C1107, Grade B; non-shrink non-catalyzed natural aggregate grout; minimum compressive strength of 7000 PSI at 28 days; 25 to 30 second flow when tested in accordance with ASTM C939 at 45 to 90 degrees F; cement gray in color;
   1. Master Builders, Masterflow 928.
   2. Euclid, HiFlow Grout
   3. Or approved

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces when applied to forms or form liners.

D. Curing Materials:
   1. Waterproof Sheet Material: Waterproof paper in accordance with ASM C171; reinforced waterproof kraft paper; white color at exterior applications
   2. Mats and Burlap: Fabric covering composed of quilted polyethylene sheeting laminated to outer covering of burlap, cotton, or other approved fabric; outer covering shall weight not less than 6 ounces per square yard.
   3. Curing Compound: ASTM C309; clear or translucent with fugitive dye; moisture loss not more than 0.03 gr./sq.cm. when tested in accordance with ASTM C156 and applied in a single coat at the manufacturer’s recommended rate.
      a. Euclid, Kurz DR.
      b. Or approved.

2.7 SAW CUT CONTROL JOINTS EQUIPMENT

A. Husqvarna Soff-Cut, specified for type and quality.

B. Saw Blades for Cutting Green Concrete.

C. Model: As instructed by manufacturer for saw model and concrete composition and hardness.

D. Depth of Cut: Minimum 1 inch deep and 1/4 depth of concrete slab, except as otherwise shown on
Drawings.
E. Width of Cut: Approximately 0.120 inch (1/8 inch).

2.8 SOURCE QUALITY CONTROL
A. Conform to provisions and limitations ACI 340R and ASTM C90.
B. Batching and Mixing: Conform to ASTM C94, Option A for exact proportioning of mix design. C. Admixtures: Add to within accuracy of 3 percent.
   1. Add separately and verify compatibility in design mix, conforming to manufacturer’s instructions.
   2. Reject concrete that shows signs of segregation due to use of admixtures.
D. Accelerating and Set Retarding Admixtures: Accepted for long hauls for extending transportation time, cold weather, and hot weather conditions conforming to hot and cold weather placement requirements.
E. Reject concrete that has reached internal temperature of 89 degree F or above and when temperature has risen 5 degrees in 10 minutes, indicating that concrete is setting up prior to discharge.
F. Admixtures: Add to within accuracy of 3 percent.
   1. Add separately and verify compatibility in design mix, conforming to manufacturer’s instructions.
   2. Reject concrete that shows signs of segregation due to use of admixtures.
G. Mix Water: When feasible, add mix water required for mix design at batch plant. H. Accelerating and Set Retarding Admixtures:
   1. Accepted for long hauls for extending transportation time, cold weather, and hot weather conditions conforming to hot and cold weather placement requirements.
   2. Measure concrete temperature and confirm that temperature has not exceeded 89 degrees F or 5 degrees F in 10 minutes before acceptance at site.
I. Batching of Dry Materials and Adding Mix Water at Site:
   1. Accepted for long hauls and for extending transportation time as an alternate procedure to adding accelerating and set retarding admixtures.
   2. Add mix water under pressure at both front and back of mixing drum.
   3. Mix at mixing speed for 70 to 100 revolutions before discharging.
J. Adding Mix Water at Project Site: Accepted as needed increase slump of concrete within first 15 minutes after truck arrives at site, under following conditions.
   1. Quantity of water does not exceed specified slump and maximum water/cement ratio and conforms to batch plant mix designer's written instructions.
   2. Special Inspector is present to monitor quantity of water added in comparison to that added at batch plant and make written record of that for each truck load delivered.
   3. Drum is turned an additional 30 revolutions or more as necessary to uniformly mix water into concrete.
   4. Water is not added to concrete batch after:
      a. Taking test cylinders, except where new test cylinders are taken at Contractor’s expense.
      b. Adding high-range water-reducing admixtures to concrete mix.
K. Do not use calcium chloride containing products.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify installation conditions as satisfactory to receive work of this Section before beginning. B.
Verify under slab vapor retarder is undamaged and conforming to Section 033000. Sand and granular fill layers over vapor retarder are not accepted.

C. Verify that seats, reinforcement, and other items cast into concrete are accurately located, securely in place, and approved before concrete placement.

3.2 PREPARATION

A. Protect Surrounding Areas: Preclude damage from work of this Section.
B. Interior Slab-On-Grade: Install vapor retarder sheeting directly under concrete slab.
C. Damaged Vapor Retarder: Lap new vapor retarder, 6 inch minimum, over damaged areas and seal watertight with tape.
D. Vapor Retarder, Formwork, Reinforcing, and Embedded Items: Remove deleterious matter, including snow, ice, water, frost, mud from surfaces contacting concrete placement.

3.2 Weather Conditions:
1. Prepare in advance for conditions where ambient temperature necessitates hot or cold weather concrete placements.
2. Do not begin placement when sun, heat, wind, or other limitations may prevent proper consolidation, finishing, and curing.
3. Do not place concrete when rain, sleet, or snow are falling, except where adequate means are taken to cover and protect concrete placements. Do not allow rain water to increase mixing water or to damage concrete surface finish during or following placement.
4. Take measures to prevent rapid evaporation of surface bleed water due to high evaporation conditions, including high winds and low humidity.
F. Reinforcement Doweled into Previously Placed Concrete: Drill holes into previously placed concrete. Place adhesive grout, and insert steel dowels.

H. Waterstop: locate at cold joints.

3.3 CONCRETE PLACEMENT


3.4 COLD WEATHER CONDITIONS

A. Conform to 306R and ACI 306.1.
B. Do not place concrete on ice, snow, frost, or frozen substrates including subgrades, formwork, reinforcement, and embedded items.
C. Temperature of Concrete: Maintain for 7 days between 50 degrees F and 90 degrees F curing temperature.
D. Take measures to protect concrete from freezing when for daily temperatures below 40 degrees F following first 5 days after placement.
E. In severe weather, at end of 5 days, gradually decrease temperature to ambient over 24 hour period.
F. Do not use calcium chloride, salt, or other materials containing anti-freeze agents or chemical accelerators.

G. Use of Heaters:
1. Do not use propane or other moisture and carbon-dioxide producing heaters
2. Maintain uniform temperature throughout heated areas.
3. Prevent rapid drying of new concrete. Elevate heaters and protect floor slabs around heaters with damp
H. Insulation:
   1. Accepted to retain heat in newly placed concrete.
   2. Conform to ACI 306R and ACI 306.1 for type and amount satisfactory for given conditions.
   3. Protect corners and edges of concrete placement.

3.5 EMBEDDED ITEMS
A. Locate and embed expansion joints, joint fillers, waterstops, anchor bolts, embedded plates, dovetail anchor slots, piping, conduit, radiant heating tubes, and other items required for work for this and other Sections.
B. Use templates, setting diagrams, and drawings, conforming to manufacturer instructions.
C. Fill voids in sleeves, inserts, and anchor slots with temporarily, easily removable material to prevent entry of concrete.
D. Do not embed aluminum except where protected from contact with concrete.

3.6 CONSTRUCTION, ISOLATION, AND CONTRACTION JOINTS
A. Conform to ACI 302.1R. Locate where shown on Drawings and accepted shop drawings. Verify locations with Architect before proceeding.
B. Locate to least impair structural integrity. Locate joints perpendicular to primary reinforcing steel.
   1. Remove laitance and defective concrete. Wash surface.
   2. Apply bonding agent against hardened concrete.
C. Bonded Construction Joints (Cold Joints) between Successive Concrete Placements: Locate joints to least impair structural integrity, perpendicular to primary reinforcing steel.
   1. Dowel between slabs, as shown on Drawings
   2. Remove laitance and defective concrete. Wash surface.
   3. Apply bonding agent against hardened concrete.
   4. Dampen concrete surface. Remove excess water from formwork.
   5. Install expanding joint strip or saw cut contraction joints over construction joints between individual slab placements.
D. Isolation Joints:
   1. Establish complete separation through floor slabs at junctions with other building elements and points of restraint including walls, columns, equipment foundations, and stairways, except elements requiring lateral restraint from slab.
   2. Fill to complete depth of joint with preformed joint filler, leaving 1/2 depth of joint width clearance below top of slab for installation of backer rod and sealant.
E. Saw Cut Contraction Joints: Saw cut interior and exterior slabs using soft cut method over green concrete as soon as slab will support foot traffic and before slab begins to experience shrinkage cracking, conforming to ACI 302.1R Chapter 3.
   1. Space saw-cuts at 2 to 3 foot spacing for each 1 inch depth of concrete slab and as accepted by Architect.
   2. Saw-cut joints minimum 1 inch deep and not less than 1/4 depth of concrete slab, except as otherwise shown on Drawings.
   3. Saw-cut joints at 45 degree angle from corner of diamond shaped slab panels.
   4. Exactly meet corners of cut outs to prevent cracking from corners.
   5. Locate contraction joints over structurally supporting beams.
   6. Maximum length to width ratio of panels in floor slabs is 1.5 to 1, although 1 to 1 is preferred.
   7. Maximum length to width ration of panels in exterior pavement is 1.25 to 1, although 1 to 1 is preferred.
   8. Do not form T-shaped or L-shaped saw-cut joints in panels.
9. Make joints continuous. Do not offset or stagger.
10. Space contraction joints equal distance between contraction joints at column lines, over construction joints, supporting structural beams, and change of substrate.
11. Burnish edges of joints while concrete is still green.

3.7 FINISHES FOR SLABS AND OTHER UNFORMED SURFACES A.

A. Finish concrete slabs to ACI 301, ACI 302.1R Chapter 8

B. Edge Forms and Screeds: Use specified screed systems that will not penetrate underlying vapor retarder at interior slab-on-grade.

C. Placement: Place at rate that allows spreading, straight-edging, and darbying or bull floating before appearance of bleed water.

D. Float Finish: Provide as final finish at concrete slabs where a float finish is desirable for improved mechanical bonding of subsequent coatings, toppings, underlayments, and floor finishes.
   1. Place, consolidate, strike off, and level concrete, eliminating high and low spots.
   2. Do not work concrete again until it is ready for floating.
   3. Allow concrete time to bleed naturally before beginning work.
   4. When bleed water sheen has disappeared, begin floating with a hand float
   5. Bull float to achieve finish tolerance requirements.
   6. Float to conventional straightedge requirements and then refloat to a uniform texture.
   7. Slope exterior paved surfaces away from building in slopes to drain without ponding.

E. Troweled Finish: Provide at exposed concrete slabs, except where a float finish is desirable for improved mechanical bonding of subsequent coatings, toppings, underlayments, and floor finishes
   1. Float concrete surface then power trowel surface.
   2. Continue troweling until surface is hard enough to ring under trowel.
   3. Trowel smooth and free of trowel marks, uniform in texture and appearance.
   4. Finish to specified tolerances. Do not burn or overwork concrete.
   5. Retain moisture in slab surface during finishing. Provide fog spray in dry or windy weather.
   6. Do not blacken or burn concrete surface with power trowel.

Light Broom Finish
   1. Provide at exterior paved surfaces and as shown on Drawings.
   2. Float finish slab and promptly after initial set, broom finish surface uniformly and perpendicularly to traffic in accepted texture.
   3. Broom finish similar to existing onsite conditions.

3.8 FILLERS AND ELASTOMERIC JOINT SEALANTS

A. Exposed Interior Saw-Cut Contraction Joints:
   1. Install semi-rigid polyurea or epoxy joint sealer, approximately matching color of finish floor slab.
   2. Install to fill 1 inch deep saw-cut contraction joint.
   3. Overfill and shave sealant flush with floor surface to make smooth surface flush with top of adjacent slab.

B. Interior and Exterior Isolation and Control Joints:
   1. Install preformed joint fillers leaving 1/2 depth of joint width clearance below top of slab for installation of backer rod and sealant.
   2. Install backer rod and elastomeric joint sealant as specified by Section 079200.
   3. Tool to concave configuration at exterior joints and flat configuration at interior joints, flush to paving surface.
   4. Do not install elastomeric sealant at exterior saw cut contraction joints.

3.9 CURING CONCRETE SLABS
A. Conform to methods specified by ACI 301 Section 5.3.6, ACI 302.1R Section 9.2.1 through 9.2.3.2 and ACI 308.1 Section 2.2 through Section 2.3.2.

B. Sheet Membrane Curing: Conform to ACI 302.1R Section 9.2, excluding Section 9.2.4, and ACI 308.1 Section 2.2 or Section 2.3, excluding Section 2.3.3.
   1. Fog spray or sprinkle and take other measures to maintain continuous layer of water over concrete surface.
   2. Cover concrete slab with wet burlap or waterproof curing film. Use waterproof paper at stained concrete and integrally colored concrete. Do not use plastic.
   3. Secure edges and corners of curing film to maintain in place over concrete and prevent drying.
   4. Leave curing film in place as necessary to maintain suitable moisture content and temperature of concrete for minimum 7 day curing period.
   5. Keep concrete moist. Add water as needed to maintain wet surface.
   6. At exterior slabs not subject to drying, curing film may be omitted when accepted by Architect.

C. Following initial curing period, take measures to remove excess unhydrated moisture from slabs to reach moisture vapor emission rates (MVER) to acceptable levels for installation of finish flooring.
   1. Measures include heating and ventilating to exhaust moisture from interior of building areas.
   2. Do not use propane heaters or other moisture generating heating equipment.

3.10 GROUTING
A. Solid Grouting under Structural Base Plates, Mechanical Equipment and Obstructed Voids and Joints.
   1. Mix grout to fluid consistency.
   2. Construct liquid tight formwork and pour grout in place.
   3. To prevent voids, pour grout from only one side so that flow exits from opposite side. Work poured grout firmly in place.
   4. Dry packing not permitted.

B. General Use: Include anchoring, filling cracks, and repairs such as filling rock pockets and pipe penetrations:
   1. Mix non-shrink, aggregate grout to optimal fluid, flowable, or plastic consistency as necessary for solid grouting and repair.
   2. Trowel grout at plastic consistency at voids and around pipe penetrations to fill voids and to match adjacent surfaces.

C. Cold Weather Grouting: When ambient temperatures are below or are predicted to fall below 45 degrees F, use cold weather grout or build a cold weather enclosure over grouting placement area and maintain minimum enclosure temperature at 60 degrees for 72 hours after grout placement and as instructed by manufacturer.

3.11 TOLERANCES
A. General Tolerances: Provide Random Traffic floor tolerances as follows, when measured in accordance with ASTM E1155, ACI 302, including those floors to receive subsequent finishes.
   1. Slabs on grade to receive resilient or resinous floor covering: FF 35, FL 25, over test area; FF 24, FL 17, minimum local value.
   2. Slabs on grade to receive carpet: FF 25, FL 20, over test area; FF17, FL15, minimum local value.

3.12 CONCRETE SURFACE REPAIRS
A. Promptly report surface defects to Architect for direction prior to making repairs.
B. Repair, patch, and remove stains rust, efflorescence, and surface deposits, as directed by
Architect.
C. Where repairs and patching are not practical as a solution to achieve intended results, cut out and replace.

3.13 REPAIRING UNFORMED SURFACES
A. Surface Defects: Repair and replace defects to specified tolerances and specification, including:
   1. Crazing and cracks, in exceeding 0.01 inch wide or penetrating to reinforcing steel.
   2. Spalls, pop-outs, honeycombs, rock pockets, and other objectionable conditions.
B. Floor Slab Flatness and Levelness: Correct floor flatness and floor levelness, not meeting specified tolerances in conformance to ACI 301, to make suitable substrate for finish floor systems.
C. Correct high areas by wet grinding after concrete has cured at least 14 days. Make test on trial area and obtain acceptance from Architect before proceeding.
D. Correct low areas and swales at floors receiving finished flooring systems by cutting out and replacing with fresh concrete or by using cementitious underlayment.

3.14 STRUCTURAL CONCRETE REPAIR A.
Prior to Substantial Completion, repair:
1. Cracks exceeding 0.005 inch width extending full depth through slabs and walls.
2. Cracks that impair structural integrity.
3. Cracks that are subject to water leakage.
B. Inject cracks with epoxy or methylmethacrylate resin.
   1. Use pressure or vacuum injection methods to monolithically bond and seal cracks without expanding cracks.
   2. Submit and follow procedures acceptable to Owner.

3.15 ADJUSTING
A. Correct defective work not conforming to specified tolerances and referenced ACI Standards and as necessary for smooth finished surface ready for installation of resilient flooring finishes specified under Section 096500 - Resilient Flooring.
B. Remove and replace slabs that show excessive shrinkage cracks and slabs that do not freely drain, as directed by Architect.

3.16 PROTECTION
A. Protect in-place concrete in conformance to ACI 301, Section 1.8.
B. Cover to protect interior exposed concrete slabs subject to foot traffic or other damage with clean, unwrinkled kraft curing paper.
C. Lay down plywood or OSB cover board over concrete slabs in pathways subject to heavy foot traffic or rolling loads over uncured concrete.
D. Stack and stockpile materials and equipment in manner to prevent mechanical and chemical damage to concrete surfaces. Maintain stacking and stockpiling loading within structural tolerances.
E. Contain and promptly clean spills to maintain concrete suitable for bonding of finish flooring and final finishing of exposed concrete slabs.

END OF SECTION
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

B. This Section includes the following:
   1. Wood framing.
   2. Wood supports.
   3. Wood blocking.
   4. Wood cants.
   5. Wood nailers.
   7. Wood preservative
   8. Plywood backing panels.
   9. Sub-framing thermal spacer

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product indicated.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that materials comply with requirements.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses.

C. Research/Evaluation Reports: For the following:
   1. Treated wood.
   2. Engineered wood products.
   5. Expansion anchors.
   6. Metal Framing anchors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for 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, the manufacturers specified.

2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Provide dressed lumber, S4S, unless otherwise indicated.
   4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

B. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
   1. Allowable Design Stresses: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Composite door, solid core doors, interior plywood, millwork, cabinetry, crown molding, counters, wood panel products used on the interior of the building shall contain ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde (NAF) resins.

D. Wood Structural Panels:
   1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise noted.
   2. Oriented Strand Board: DOC PS 2.

2.02 ADHESIVES, SEALANTS, PAINTS & COATINGS

A. Refer to VOC limit tables in Section 01 81 16 for VOC limits for products in this section

B. Adhesives used in field and shop-fabricated assemblies containing these composite wood products shall contain ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde (NAF) resins.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2 (lumber), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

C. Mark each treated item with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood framing members less than 6 inches above grade.
   4. Wood floor plates that are installed over concrete slabs directly in contact with earth.

2.4 DIMENSION LUMBER

A. General: Of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

B. Framing Species and Grade: As indicated on Structural Drawings.

C. Exposed Framing: Hand select material for uniformity of appearance and freedom from characteristics that would impair finish appearance.
   1. Framing Species and Grade: As indicated on Structural Drawings.

2.5 TIMBER AND MISCELLANEOUS LUMBER

A. For timbers of 5-inch nominal size and thicker, provide framing species and grade as indicated on Structural Drawings.

B. Provide miscellaneous lumber for support or attachment of other construction, including the following:
   1. Rooftop equipment bases and support curbs.
   2. Blocking.
   3. Cants.
   5. Furring.

C. For items of dimension lumber size, provide Construction, Stud or No. 2 grade lumber with 19 percent maximum moisture content of any species.

D. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
   1. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

2.6 ENGINEERED WOOD PRODUCTS

A. Laminated-Veneer Lumber: Composite of wood veneers with grain primarily parallel to member lengths, manufactured with exterior-type adhesive complying with ASTM D 2559. Allowable design values determined according to ASTM D 5456.
   1. Manufacturer:
      a. Trus Joist MacMillan
   2. Material Properties as indicated on Structural Drawings.

B. Wood I-Joists: Prefabricated units complying with APA PRI-400 depths and performance ratings not less than those indicated.
1. Manufacturer:
   a. Trus Joist MacMillan
2. Material Requirements as indicated on Structural Drawings.
3. Structural Capacities: Establish and monitor structural capacities according to ASTM D 5055.

1. Manufacturer:
   a. Trus Joist MacMillan
2. Material Requirements as indicated on Structural Drawings.
3. Trademark: Factory mark with APA trademark indicating thickness, grade, and compliance with APA standard.

2.7 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated, or, if not indicated, not less than 1/2-inch thick.

2.8 SUB-FRAMING THERMAL SPACER

A. Sub-framing Thermal Spacer: 100 % Pultruded glass fibre and thermoset polyester resin insulation clip. For all exterior rainscreen cladding applications.
   1. Thermal Spacer thickness for top, base and web: 3/16 inches nominal.
   2. Thermal spacer depth: 2 inches nominal. Depth tolerance: ± 0.005 inches.

B. Spacer Fasteners: High hex head washer head with sharp twin lead threaded design of heat treated corrosion resistant coated steel.
   1. Fastener for steel framing: 1/4 - 14 x 4 inches long with hex head.
      b. Embedment depth: 1 1/2 inches, except when into hollow concrete masonry unit, not less than 1 inch.

2.9 MISCELLANEOUS MATERIALS

A. Fasteners:
   1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
   3. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

B. Metal Framing Anchors: Made from hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
1. Manufacturer:
   a. Simpson Strong-Tie Company, Inc.
2. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
3. Allowable Design Loads: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated on Structural Drawings, complying with the following:
   1. CABO NER-272 for power-driven fasteners.
   2. Published requirements of metal framing anchor manufacturer.

D. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.


F. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.


H. Fastening Methods:
   1. Subflooring: Glue and nail to wood framing.
   2. Sheathing: Nail or staple to wood framing as indicated on Structural Drawings.
   3. Plywood Backing Panels: Nail or screw to supports.

I. Building Wrap Application: Cover wall sheathing with building wrap as indicated. Cover upstanding flashing with 4-inch overlap. Seal seams, edges, and penetrations with tape.

3.2 PREPARATION (SUB-FRAMING THERMAL SPACER)
A. Pre-drill concrete or concrete masonry unit substrate to 1/2 inch deeper than anticipated embedment depth of fastener into substrate.
   1. Use drill diameter approximately 1/16 inches less than screw diameter in accordance with fastener manufacturer’s written recommendations.

B. Sub-framing: Ensure thermal spacer type is selected to accommodate orientation of vertical and horizontal sub-framing.

C. Sub-framing Thermal Spacer Installation: Install thermal spacers in accordance with spacer manufacturer’s written recommendations.
   1. Thermal Spacer Installation: Clip thermal spacer to Z-girt and fasten girt directly to substrate [ [at 26 inches maximum on center vertically and 16 inches maximum on center horizontally] [or as directed by [Cladding Engineer] [Consultant] ].
   2. Installation sequence for spacers, sub-framing, and insulation - Option 1:
      a. Pre-punch holes or pre-drill holes in Z-girts and tracks to accommodate fasteners.
      b. Position Z-girts directly over thermal spacer before installation of fasteners.
      c. Completely install thermal spacers and screws for first Z-girt / track. For subsequent girts:
         1) Fasten top spacer with single screw through Z-girt and spacer into substrate ensuring spacer can pivot for accurate alignment.
         2) Friction fit insulation in place before completing installation of remaining screws to secure Z-girt and thermal spacers.
            a) Ensure insulation is tightly fitted with sides of insulation slightly compressed at each insulation spacer.
            b) Ensure insulation pieces are in contact with no linear gaps between spacers.
   3. Installation sequence for spacers, sub-framing, and insulation - Option 2:
      a. Pre-punch or pre-drill holes in Z-girts and tracks to accommodate fasteners.
      b. Position Z-girts directly over thermal spacer before installation of fasteners.
      c. Completely install spacers, screws and sub-framing, prior to installing insulation.
      d. Friction fit insulation in place as follows:
         1) For semi-rigid insulation batts or boards, score or cut insulation down its centerline to 50 % maximum of its depth to enable fitting insulation in correct position.
         2) Fold edges of insulation board back to enable friction fitting in correct position. Position edges of partially folded board into space between girts and thermal spacers, and flatten partially folded board against substrate.
         3) Ensure insulation is tightly fitted with sides of insulation slightly compressed at each insulation spacer.
      e. Install corrosion resistant stick pins or other mechanical insulation retention devices 16 inches maximum on center along centreline of insulation batts or boards and in accordance with insulation manufacturer’s written recommendations.
         1) Use sufficient number of stick pins or retention devices to ensure insulation remains flat and in correct position.
         2) Use 3 minimum stick pins or retention devices for each 4 feet long batt or board.
      f. Ensure insulation pieces are in contact with no linear gaps between spacers.

END OF SECTION 06 10 00
SECTION 131102 – SHOTCRETE

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 shotcrete applied by dry-mix or wet-mix process for the following:
   1. Pre-manufactured block gravity walls.
B. Related Sections include the following:
   1. Division 032100, “Reinforcing Steel” for steel reinforcement
   2. Division 033000, “Cast in Place Concrete” for concrete
   3. Division 323216, “Precast Modular Block Retaining Walls” for gravity retaining walls

1.3 DEFINITIONS
A. Shotcrete: Mortar or concrete pneumatically projected onto a surface at high velocity. B. Dry-Mix Shotcrete: Shotcrete with most of the mixing water added at nozzle.
C. Wet-Mix Shotcrete: Shotcrete with ingredients, including mixing water, mixed before introduction into delivery hose.

1.4 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS
A. Product Data: For each type of product including reinforcement and forming accessories, shotcrete materials, admixtures, and curing compounds.
B. Design Mixtures: For each shotcrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. For predampened dry-mix mixtures, indicate amounts of mixing water to be added to the dry-mix materials before mixing and conveying through the delivery hose.

C. Shop Drawings: For shotcrete installation. Include support and anchor details; reinforcement materials and grades and details of fabricating, bending, and placing reinforcement; number and location of splices; special reinforcement required for openings through shotcrete structures; formwork materials and details of formwork fabrication, assembly, and support; and locations of proposed construction joints.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For each of the following:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials.

C. Preconstruction Test Reports: For shotcrete.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer employing nozzle operators for the Project, each of whom attains mean core grades not exceeding 2.5, according to ACI 506.2, on preconstruction tests, is ACI Shotcrete Nozzleman certified in Dry-Mix Process for Vertical Position, is ACI Shotcrete Nozzleman certified in Wet-Mix Process for Vertical Position as appropriate to the required shotcrete work.

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.


D. Shotcrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design shotcrete mixtures.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing and inspections indicated below:
   1. Produce shotcrete test panels before shotcrete placement according to requirements in ACI 506.2 and ASTM C 1140 for each design mixture, shooting orientation, and nozzle
operator. Produce test panels with dimensions of 24 by 24 inches (600 by 600 mm) minimum and of average thickness of shotcrete, but not less than 3-1/2 inches (90 mm).

2. From each test panel, testing agency will obtain six test specimens: one set of three specimens unreinforced and one set of three specimens reinforced. Agency will perform the following:
   a. Strength Testing: Test each set of unreinforced specimens for compressive strength according to ASTM C 42/C 42M.
   b. Core Grading: Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

PART 2 - PRODUCTS

2.1 FORM MATERIALS
   A. Forms: Form-facing panels that will provide continuous, straight, smooth, concrete surfaces. Furnish panels in largest practical sizes to minimize number of joints.

2.2 REINFORCING MATERIALS
   A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
   B. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufactured according to CRSI's "Manual of Standard Practice" and as follows:
      1. For uncoated reinforcement, use all-plastic bar supports.
   C. Reinforcing Anchors: ASTM A 36/A 36M, unheaded rods or ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), hex-head bolts; carbon steel; and carbon-steel nuts.
      1. Finish: Plain, uncoated.

2.3 SHOTCRETE MATERIALS
   A. Source Limitations for Shotcrete: Obtain each color, size, type, and variety of shotcrete material and shotcrete mixture from single manufacturer with resources to provide shotcrete of consistent quality in appearance and physical properties.
   B. Portland Cement: ASTM C 150, Type I or Type III. Use only one brand and type of cement for Project.
      1. Fly Ash: ASTM C 618, Class C or Class F.
   C. Normal-Weight Aggregates: ASTM C 33, from a single source, and as follows:
1. Combined Aggregate Size: ACI 506R or ASTM C 1436, Grading No. 2 sieve analysis.

D. Water: Potable, complying with ASTM C 94/C 94M, free from deleterious materials that may affect color stability, setting, or strength of shotcrete.

E. Ground Wire: High-strength steel wire, 0.8 to 1.0 mm in diameter.


2.4 ADMIXTURES

A. General: ASTM C 1141, Class A (liquid) or Class B (non-liquid), but limited to the following admixture materials. Provide admixtures for shotcrete that contain not more than 0.1 percent chloride ions. Certify compatibility of admixtures with each other and with other cementitious materials.

1. Accelerating Admixture, Conventional: ASTM C 494/C 494M, Type C or Type E.
2. Pozzolanic Admixture: Fly ash, ground granulated blast-furnace slag, and silica fume as limited in "Shotcrete Materials" Article.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry, or cotton mats.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet. C.

Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.6 SHOTCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of shotcrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 506.2.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based laboratory trial mixture or field test data, or both.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Cementitious Materials: Limit use of fly ash to not exceed, in combination, 15 percent of portland cement by weight.
D. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.

E. Admixtures: When included in shotcrete design mixtures, use admixtures according to manufacturer's written instructions.

F. Design-Mixture Adjustments: Subject to compliance with requirements, shotcrete design-mixture adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.7 SHOTCRETE MIXTURES

A. Shotcrete Mixture: Proportion mixture to provide shotcrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).

2. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight wet-mix shotcrete having an air content before pumping of 8 percent with a tolerance of plus or minus 1-1/2 percent.

2.8 SHOTCRETE EQUIPMENT

A. Mixing Equipment: Capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.

B. Dry-Mix Delivery Equipment: Capable of discharging aggregate-cement mixture into delivery hose under close control and maintaining continuous stream of uniformly mixed materials at required velocity to discharge nozzle. Equip discharge nozzle with manually operated water-injection system for directing even distribution of water to aggregate-cement mixture.

1. Provide uniform, steady supply of clean, compressed air to maintain constant nozzle velocity while simultaneously operating blow pipe for cleaning away rebound.

2. Provide water supply with uniform pressure at discharge nozzle to ensure uniform mixing with aggregate-cement mix. Provide water pump to system if line water pressure is inadequate.

C. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

2.9 BATCHING AND MIXING

A. Dry-Mix Process: Measure mixture proportions by weight batching according to ASTM C 94/C 94M or by volume batching complying with ASTM C 685/C 685M requirements.

1. In volume batching, adjust fine-aggregate volume for bulking. Test fine-aggregate moisture content at least once daily to determine extent of bulking.

2. Prepackaged shotcrete materials may be used at Contractor's option. Predampen prepackaged shotcrete materials and mix before use.
B. Wet-Mix Process: Measure, batch, mix, and deliver shotcrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. Comply with ASTM C 685/C 685M when shotcrete ingredients are delivered dry and proportioned and mixed on-site.

2.10 RELATED MATERIALS

A. Latex Bonding Agent: ASTM C 1059/C 1059M, Type II.

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. Latex Bonding Agent, Type II (Non-Redispersible):
      1) Dayton Superior Corporation; Conspec Strong Bond.
      2) Euclid Chemical Company (The), an RPM company; Flex-Con.
      3) W. R. Meadows, Inc.; Sealtight Acry-Lok.
      4) Kaufinan Products, Inc.; Surebond

2.11 REPAIR MATERIALS

A. Concrete Patching Mortar: Chemical treatment for waterproofing concrete.

1. Xypex Concrete Waterproofing by Crystallization, Xypex Chemical Corporation.
   a. Xypex Concentrate.

2.12 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Available Manufacturers:
   a. Bometals, Inc.
   b. Greenstreak.
   c. Meadows, W. R., Inc.
   d. Murphy, Paul Plastics Co.
   e. Progress Unlimited, Inc.
   f. Tamms Industries, Inc.
   g. Vinylex Corp.

2. Profile: Ribbed without center bulb.
3. Dimensions: 4 inches by 3/16 inch thick (150 mm by 10 mm thick); nontapered.
B. Non-Expanding Plastic Adhesive Waterstops: Manufactured rectangular or trapezoidal strip, single-component, self-sealing adhesive compound, for adhesive bonding to concrete, 5/8 by 1-1/2 inch.

1. Products: Subject to compliance with requirements, provide the following:

   a. Synko-Flex SF302, Henry Company.

      1) Synko-Flex SF311 Solvent Based Primer.

2.13 DRAINAGE FILL

A. Drainage Course under bottom slabs: Narrowly graded mixture of frost-free, 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.

PART 3 - EXECUTION

3.1 PREPARATION

A. Concrete: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces to saturated, surface-dry condition before shotcreting.

   1. Abrasive blast or hydroblast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.

B. Earth: Compact and trim to line and grade before placing shotcrete. Do not place shotcrete on frozen surfaces. Dampen surfaces to saturated, surface-dry condition before shotcreting.

C. Rock: Clean rock surfaces of loose materials, mud, and other foreign matter that might weaken shotcrete bonding. Dampen surfaces to saturated, surface-dry condition before shotcreting.

D. Steel: Clean steel surfaces by abrasive blasting according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

3.2 FORMS

A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.
1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.
2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent mortar leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.

B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

3.3 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, and other materials that weaken shotcrete bonding.

C. Securely embed reinforcing anchors into existing substrates, located as required.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports, bolsters, chairs, spacers, and other devices as required to maintain minimum concrete cover.

E. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.

3.4 WATERSTOPS

A. Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions. Prevent displacement during shotcrete application.

3.5 JOINTS

A. General: Construct joints at locations indicated or as approved by Architect.

B. Construction Joints: Locate and install construction joints tapered to a 1:1 slope where joint is not subject to compression loads and square where joint is perpendicular to main reinforcement. Continue reinforcement through construction joints unless otherwise indicated.
3.6 ALIGNMENT CONTROL

A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

3.7 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by shotcrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.8 APPLICATION

A. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.

B. Moisten wood forms immediately before placing shotcrete where form coatings are not used. C. Apply shotcrete according to ACI 506.2.

D. Apply dry-mix shotcrete materials within 45 minutes after predampening and wet-mix shotcrete materials within 90 minutes after batching.

E. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.

1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.

F. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray, and prevent buildup against front face during shotcreting.

G. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.

H. Do not permit shotcrete to sag, slough, or dislodge.

I. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.

J. Do not disturb shotcrete surfaces before beginning finishing operations.

K. Remove ground wires or other alignment-control devices after shotcrete placement.

L. Shotcrete Core Grade: Apply shotcrete to achieve mean core grades not exceeding 2.5 according to ACI 506.2, with no single core grade exceeding 3.0.
M. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117, increased by a factor of two.

N. Cold-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 306.1 and as follows. Protect shotcrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. Discontinue shotcreting when ambient temperature is 40 deg F (4.4 deg C) and falling.
2. Uniformly heat water and aggregates before mixing to obtain a shotcrete shooting temperature of not less than 50 deg F (10 deg C) and not more than 90 deg F (32 deg C).
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents.

O. Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to recommendations of ACI 305R when hot-weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:

1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 100 deg F (38 deg C) for dry mix or 90 deg F (32 deg C) for wet mix.
2. Reduce temperature of reinforcing steel and receiving surfaces below 100 deg F (38 deg C) before shotcreting.

3.9 SURFACE FINISHES

A. General: Finish shotcrete according to descriptions in ACI 506R. B.

Natural Finishes:

1. Gun Finish: Natural undisturbed finish as sprayed.
2. Rod Finish: Rough-textured finish obtained by screeding or cutting exposed face of shotcrete to plane with cutting rod, edge of trowel, or straightedge after initial set. Do not push or float with flat part of trowel.
3. Broom Finish: Rough-textured finish obtained by screeding or cutting exposed face of shotcrete to plane with cutting rod, edge of trowel, or straightedge after initial set; followed by uniform brooming.

C. Flash-Coat Finish: After screeding or cutting exposed face of shotcrete to plane after initial set, apply up to 1/4-inch (6-mm) coat of shotcrete using ACI 506R, Grading No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve to provide a finely textured finish.

D. Flash-Coat with Final Finish: After screeding or cutting exposed face of shotcrete to plane after initial set, apply up to 1/4-inch (6-mm) coat of shotcrete using ACI 506R, Grading No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve, and apply wood-float finish.
3.10 CURING

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

Begin curing immediately after placing and finishing but not before free water, if any, has disappeared from shotcrete surface.

C. Curing Exposed Surfaces: Cure shotcrete by one of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Water-saturated absorptive covers or moisture-retaining covers. Lap and seal sides and ends of covers with 12-inch (300-mm) lap over adjacent covers.

2. Curing Compound: Apply uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   a. Apply curing compound to natural gun finish or flash-coat shotcrete at rate of 1 gal./100 sq. ft. (1 L/2.5 sq. m).

D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.11 FORM REMOVAL

A. Forms not supporting weight of shotcrete may be removed after curing for 24 consecutive hours at not less than 50 deg F (10 deg C), provided shotcrete is hard enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.

1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are unacceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.
3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to sample materials, visually grade cores, perform tests, and submit reports during shotcreting.

B. Air Content: ASTM C 173/C 173M, volumetric method or ASTM C 231, pressure method; one test for each compressive-strength test for each mixture of air-entrained, wet-mix shotcrete measured before pumping.

C. Shotcrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.

D. Test Panels: Make a test panel, reinforced as in structure, for each shotcrete mixture and for each workday or for every 50 cu. yd. (38 cu. m) of shotcrete placed, whichever is less. Produce test panels with dimensions of 24 by 24 inches (600 by 600 mm) minimum and of thickness and reinforcing layout of shotcrete work on project. Testing agency will obtain sets of test specimens from each test panel.

   1. Compressive Strength Testing: One set of three unreinforced specimens. Test each set of unreinforced specimens for compressive strength according to ASTM C 1140 and construction testing requirements in ACI 506.2.
   2. Visual Core Grading: One set of three reinforced specimens. Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

E. In-Place Shotcrete Testing: Only if samples obtained in item D indicate unsatisfactory shotcrete, and only if directed by Owner, Architect or Engineer, take a set of 3 unreinforced cores for each mix and for each workday or for every 50 cu. yd. (38 cu. m) of shotcrete placed; whichever is less. Do not cut steel reinforcement.

F. Strength of shotcrete will be considered satisfactory according to the following:

   1. Specimen Cores: Mean compressive strength of each set of three unreinforced cores equals or exceeds 85 percent of specified compressive strength, with no individual core less than 75 percent of specified compressive strength.
   2. Specimen Cubes: Mean compressive strength of each set of three unreinforced cubes shall equal or exceed design compressive strength with no individual cube less than 88 percent of specified compressive strength.

3.13 REPAIRS

A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.

   1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs.
WOODLAND NORTH APARTMENTS
LAKE FOREST PARK
JANUARY 15th, 2020

SECTION 13 11 02
SHOTCRETE

2. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders.

3. Dampen surfaces and apply new shotcrete.

B. Repair core holes from in-place testing according to repair provisions in ACI 301, except do not use shotcrete. Match adjacent color and finish.

3.14 CLEANING

A. Immediately remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement.

END OF SECTION 131102
WOODLAND NORTH APARTMENTS
LAKE FOREST PARK
JANUARY 15th, 2020

SECTION 31 10 00
SITE PREPARATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to following:
   1. Mark clearing limits and provide temporary erosion and sedimentation control facilities.
   2. Remove vegetation within areas to be cleared for new construction and as indicated on plans.
   3. Remove rockeries, walls, curbs, fencing, pavement and all miscellaneous other items as required to construct new improvements.
   4. Grub and remove materials from below the ground surface within areas to be cleared for new construction.
   5. Dispose of materials off site.
   6. Identify, coordinate with utility Owner, disconnect, cap and remove utilities as required.
   7. Protect from harm any buildings, structures, trees, or other objects to remain.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Project Manual, including but not limited to following:
   - Section 01 56 00 - Construction Barriers and Enclosures
   - Section 01 56 39 - Temporary Tree and Plant Protection
   - Section 01 5 7 00 - Temporary Controls
   - Section 01 71 23 - Field Engineering
   - Section 31 20 00 - Earthwork

1.3 REFERENCES

WSDOT-APWA 2018 Standard Specifications for Road, Bridge, and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.


COLFP City of Lake Forest Park Code and Engineering Development Manual and Standard Plans

1.4 DESCRIPTION

A. Design and construct erosion and sedimentation control in accordance with COLFP and DOE requirements, except as modified herein. Clear, strip and grub portions of site to receive improvements. Save and protect from all harm any trees, or other objects to remain. Remove, from area to be cleared, all other growth unless otherwise indicated or directed. Remove existing improvements, including but not limited to paving, slabs, and walks as indicated on plans and as directed by Architect. Perform work incrementally as necessary to minimize areas of exposed soils and avoid direct exposure of bare soils to precipitation.
1.5 EXISTING CONDITIONS

A. Protection of Existing Improvements: Provide, erect and maintain barricades, coverings, or other types of protection necessary to prevent damage to existing improvements. Restore any site improvements to remain, including but not limited to landscaping, pavement, walks, structures, fences and utilities, damaged by this work to their original condition, as acceptable to Owner.

B. Contact utility companies and request meter readings, utility cutoffs, and meter and line removals. Verify that all appropriate services have been disconnected. Contractor shall pay for all fees and costs associated with utility disconnects, capping, line and meter removals.

C. Do not shut off or cap utilities without prior notice. Utilities shall remain in service unless otherwise directed. Coordinate work with Division 1 requirements. Maintain drains and sewers open for free drainage. Provide all means necessary to prevent damage to existing utilities to remain, including but not limited to monitoring, steel plating, vehicular load restrictions, and any other measures required for preservation and protection.

D. Objectionable Noises: Limit use of air hammers and other noisy equipment. Conform with local governing requirements regarding Noise Control.

E. Maintain vehicular and pedestrian traffic routes:
   1. Do not close or obstruct streets, parking lots, access drives, firelanes, sidewalks, alleys or passageways without permission from authorities having jurisdiction.
   2. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

1.6 DIMENSIONS AND LAYOUT

A. The Contractor shall be responsible for furnishing, setting and marking all line, location and layout stakes.

B. The Contractor shall be responsible for deriving layout information from an AutoCad file provided to him for this purpose.

PART 2 - PRODUCTS

2.1 EROSION CONTROL PRODUCTS

A. All products utilized for erosion control shall be in conformance with COLFP/DOE.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify clearing and grubbing and site improvement removal may safely and appropriately begin.

B. Obtain required use permits and permission from local governing authorities and Owner prior to commencing work.

3.2 EROSION CONTROL

A. Contractor shall design, construct, maintain, upgrade and adjust the erosion control system in accordance with the drawings and his operations in order to maintain compliance with all project permits and approvals. Contractor shall pay for all costs associated with the design, construction, maintenance,
upgrading and adjustment of the erosion control system throughout project duration.

B. Contractor shall obtain all permits and approvals required for his handling of discharges from the site during construction. Contractor shall provide for all requirements related to construction storm water or groundwater discharge from the site, including but not limited to storage, filtration, pumping, sampling and testing.

C. Contractor shall provide all compliance actions required to maintain permit compliance, including but not limited to permit acquisition for Contractor designed systems, monitoring, sampling, testing, reporting, documentation and coordination with AHJ’s. A qualified Construction Erosion Sediment Control Lead (CESCL) must be assigned to the Contractor's crew for this work and shall be on site at all times when TESC work is being performed, together with all necessary equipment, supplies and instruments related thereto.

D. Access Streets and Roadways: Provide wheel cleaning facilities to clean wheels and undercarriage of trucks before leaving site, as necessary to prevent dirt from being carried onto public streets. If streets are fouled, clean immediately in conformance with AHJ and all governing requirements and regulations.

E. Provide catch basin protection between frame and grate of existing catch basins in and adjacent to work area. Provide catch basin protection between frame and grate of new catch basins and area drains following installation, until site paving is completed.

F. Provide stockpile covering in accordance with Section 31 20 00.

G. Provide temporary cover measures to prevent exposure of bare soils to precipitation. Approved cover methods are mulching (straw or wood fiber cellulose) erosion control blankets, and hydroteening. Straw mulch shall be applied uniformly to provide a minimum in place thickness of 3”. Wood fiber cellulose shall be applied uniformly to provide 30 lbs. per 1000 SF.

H. Remove all TESC facilities prior to completion of work and coincident with final stabilization of contributing drainage area served by each facility.

3.3 TREE AND SHRUB PROTECTION

A. The Contractor shall preserve and protect existing trees and vegetation which are outside clearing limits or indicated to be protected, per Section 01 56 39.

3.4 CLEARING

A. Remove trees, underbrush, and all vegetation in areas to be improved, unless noted otherwise. Perform removal operations in a manner to protect adjacent property and improvements to remain.

B. Save and protect trees within tree protection areas. Protect all off-site trees along adjacent roadways and on surrounding properties throughout duration of project construction. Repair/replace damaged trees as required.

3.5 STRIPING TOPSOIL

A. Strip topsoil to full depth in areas to be improved, unless noted otherwise.

3.6 GRUBBING

A. General: Grub areas to be improved.
   1. Excavate and remove all stumps to a depth of 2'-0" below proposed or existing grade, whichever is
lower.
2. Excavate and remove roots larger than 1-1/2 inches in diameter, rocks, boulders, any remaining paving, and the like, as well as other objectionable materials to a depth of 2'-0" below proposed or existing grade, whichever is lower.

3.7 SITE IMPROVEMENT REMOVALS

A. Completely remove and dispose of pavement, structures, fences, culverts and other obstructions, unless indicated to be saved. Break up, load, and dispose of pavements. Take care in removing pavement, structures, and all other items that damage does not occur to existing improvements which are to remain in place. Make a neat vertical saw cut at the boundaries of all areas to be removed. Sawcut all concrete walk removals at the next adjacent joint. Replace adjacent materials designated to remain that are damaged due to Contractor's operations at no additional cost to the Owner.

B. Sprinkle excavated material and access roads as necessary to limit dust to lowest practicable level. Do not use water to extent causing flooding, contaminated runoff or icing.

C. Remove all piping and utility structures designated for removal. All piping to be abandoned in place shall be fully plugged with cement concrete at each end, to a distance of 3’ from the pipe end.
   1. Repair damage to existing utilities to remain at Contractor's expense.
   2. In the event the Contractor encounters utility lines not shown on the site plan or otherwise indicated to be saved, removed or abandoned, the location of such lines shall be marked in the field and the Architect/Engineer notified.

3.8 DRAINAGE

A. Keep on site and off site drainage systems open for drainage at all times. Mud/sediment build-up shall be removed and not flushed into the downstream system. If sediment is discharged to on site or offsite drainage systems, such systems shall be cleaned of all debris and sediment.

B. Keep open pits and holes caused as a result of demolition work free of standing water.

3.9 FILLING DEPRESSIONS

A. Fill depressions caused by clearing, grubbing, demolition and utility operations with compacted structural fill material unless further excavation or earthwork is indicated. Structural fill material shall be placed and compacted in accordance with Section 31 20 00.

3.10 DISPOSAL OF MATERIALS

A. Dispose of material off site in a manner consistent with all government regulations. In no case shall material be left on the project site, shoved onto abutting private properties, or be buried in embankments or trenches on the project site. Do not deposit debris in any stream or body of water, or in any street or alley, or upon any private property except by written consent of the private property owner. Maintain hauling routes clean and free of any debris resulting from work of this Section.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to following:
   1. Accomplishing indicated and required excavation, filling, backfilling, compaction, subgrade preparation, rough and finish grading, and all other earthwork required for construction of new improvements.
   2. Providing gravel surfacing and capillary break material.
   3. Importing required materials.
   4. Utility and utility structure trenching, excavation, bedding and backfilling.
   5. Removing materials from the site.
   6. Coordinating earthwork operations and requirements with other work of the project.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Specifications, including but not limited to following:

Section 014300 – Quality Assurance
Section 014523 – Testing and Inspection Services

1.3 REFERENCES

WSDOT-APWA 2018 Standard Specifications for Road, Bridge, and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.

ASTM D1557 Methods of Test for Moisture-Density Relations of Soils, Using 10 lb (4.5 kg) Rammer and 18 In. (457 mm) Drop


COLFP City of Lake Forest Park Code and Engineering Development Manual and Standard Plans

1.4 SUBMITTALS

A. Product information for all imported materials to be used shall be submitted 30 days in advance of use. Information shall identify the supplier of the imported material, and shall comprise of a certified gradation curve from an established testing agency demonstrating compliance with the specified gradation. Testing for compliance shall have been performed no more than 4 months prior to the date of submittal.

1.5 QUALITY ASSURANCE

A. Testing for benefit of Owner:
1. Owner’s Geotechnical Engineer will take samples and perform moisture content, gradation, compaction, and density tests during placement of fill and backfill materials to check compliance with these Specifications, for the benefit of the Owner.
2. The Contractor shall remove material at locations designated by the Geotechnical Engineer and provide such assistance as necessary for sampling and testing.
3. The Geotechnical Engineer may direct the Contractor to construct inspection trenches in compacted or consolidated materials to determine that the Contractor has complied with these Specifications.
4. Tests will be made by an outside Testing Agency for the following items, but not limited to:
   a. Moisture content - ASTM D3017
   b. Gradation - ASTM C136, ASTM D422
   c. Density in-place - ASTM D2922, or equivalent.
   d. Moisture-density relationships - ASTM D1557

B. Contractor shall be responsible for performing any and all testing necessary for his verification of proper compaction.

1.6 DEFINITIONS

A. Compaction: The degree of compaction is specified as percent compaction. Maximum or relative densities refer to dry soil densities obtainable at optimum moisture content.

B. Excavation slope: Defined as an inclined surface formed by removing material from below existing grade.

C. Fill slope: Defined as an inclined surface formed by placement of material above existing grade.

1.7 DIMENSIONS AND LAYOUT

A. See Section 311000, Paragraph 1.6.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: All materials shall be naturally occurring. No recycled materials shall be allowed. Conform to the requirements of the Geotechnical Engineering reports prepared for the project.

B. Fill material shall be imported Structural Fill.

C. Backfill for retaining walls and rock walls shall be clean (less than 5% fines) imported Structural Fill or approved by AHJ and Engineer.

D. Bedding material for utilities other than gas, electrical and communications shall be crushed surfacing top course per WSDOT/APWA Section 9-03.9(3) or approved by AHJ and Engineer.

E. Bedding material for gas, electrical and communications shall be Class 2 fine aggregate per WSDOT/APWA Section 9-03.1(2) or approved by AHJ and Engineer.

F. Material for utility trench backfill and utility structure backfill on site shall be imported structural fill, unless indicated otherwise on plans or approved by AHJ and Engineer.

G. Material for utility trench backfill and utility structure backfill in ROW shall be Crushed Surfacing Top Course per WSDOT/APWA Section 9-03.9(3) or approved by AHJ and Engineer.
H. Structural Fill: Suitable on site material or imported structural fill material.

I. Suitable on site material: On site excavated granular soils cleaned of organic and deleterious materials and rocks or clumps greater than 6 inches in overall dimension. Moisture content of suitable on site material at the time of placement shall be such that the specified compaction can be readily attained.

J. Imported structural fill material: Clean, granular, well-graded sand and gravel materials from offsite sources, free of organic or recycled material, debris and other deleterious material. Imported structural fill shall conform to the following gradation requirements:

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<th>U.S. Standard Sieve Size</th>
<th>Percent Passing by Dry Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 inch</td>
<td>100</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>50 - 100</td>
</tr>
<tr>
<td>No. 4</td>
<td>25 - 70</td>
</tr>
<tr>
<td>No. 10</td>
<td>10 - 50</td>
</tr>
<tr>
<td>No. 40</td>
<td>0 - 20</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 – 5</td>
</tr>
</tbody>
</table>

K. Capillary Break Material: Crushed or partially crushed granular stone and/or rock material meeting the following gradation:

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Size</th>
<th>Percent Passing by Dry Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 inch</td>
<td>99-100</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>80 - 100</td>
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<tr>
<td>3/8 inch</td>
<td>0 - 40</td>
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<tr>
<td>No. 4</td>
<td>0 - 4</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 – 2</td>
</tr>
</tbody>
</table>

PART 3 EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENT CONTROL

A. All work shall conform to the Contract Documents and applicable permits.

3.2 PROTECTION OF EXISTING FACILITIES

A. Utilities: The Contractor shall protect from damage private and public utilities in accordance with 1-07.17 of WSDOT-APWA, except subsections 1-07.17(1) and 1-07.17(2) shall not apply.

B. Pavement: The Contractor shall protect from damage all pavement, paved or gravelled areas intended to remain.

C. Access Streets and Roadways: Provide and maintain wheel cleaning stations to clean wheels and undercarriage of trucks before leaving site, as necessary to prevent dirt from being carried onto public streets. If streets are fouled, they must be cleaned immediately in conformance with FWRC and all governing requirements and regulations.
D. Repair and/or replacement of damaged facilities will be accomplished at the Contractor's expense.

3.3 EXCAVATION, FILL AND BACKFILL

A. General:
1. Provide excavation of whatever nature required for construction of the work; verify character, quality, and disposition of material to be excavated prior to commencing. Blasting will not be permitted.
2. Keep excavations free from water. Dewatering shall be accomplished by using ditches, sumps and pumps depending on the groundwater level at the time of construction. Contractor shall obtain all permits and approvals required for his discharges to storm water and sanitary sewer systems during construction. Contractor shall provide for all requirements related to such discharges, including but not limited to storage, filtration, pumping, sampling, testing and reporting to AHJ.
3. At the time of placement, fill and backfill material placed shall be within 2% of the materials optimum moisture content.
4. Excavation and grading within bioretention areas shall be performed by machines operating adjacent to the bioretention areas only. If equipment is necessary inside bioretention areas, use only Low Ground Pressure (6.5 PSI MAX) equipment in limited areas. Contractor shall provide one week advance notice to Geotechnical Engineer prior to exposing subgrades in bioretention areas, and shall provide assistance per paragraph 1.5 to allow for verification of expected subgrade conditions.

B. Trench Excavation:
1. Grade and smooth bottoms of trenches to furnish uniform bearing and support for type of utility being installed; remove rocks and similar material causing point bearings.
2. Form bell holes and depressions for joints after grading of bottom limit such depressions to lengths, depths, and widths required for particular type of joint.
3. Excavate to depths allowing for required bedding.

C. Catch basins, manholes, vaults and other utility structures
1. Excavate to furnish a minimum of 12 inches between sides of excavation and outer surfaces of structure. Take care to excavate to exact depths required; fill low areas with compacted imported structural fill.
2. Provide minimum 4’ thick compacted base of CSTC under structure.

D. Building Slab on Grade
1. Grade and smooth subgrades to furnish uniform bearing and support; remove rocks and similar material causing point bearings.

E. Foundations and Footings:
1. Grade and smooth subgrade to furnish uniform bearing and support; remove rocks and similar material causing point bearings.

F. Fill and Backfill:
1. All areas that are to receive fill or backfill shall be observed by the Engineer prior to the placement of any material. Where existing slopes exceed 25%, fill shall be keyed and benched into the existing slope. Horizontal width of each bench cut shall be a minimum of four feet into native soil and vertical depth of each bench cut shall be a minimum of two feet into native soil.
2. Fill and backfill material shall be placed and compacted in accordance with Paragraph 3.7 of this Section.
3. Bedding for Utilities: Properly place material in trenches. Do not disturb sides of trenches. Compact and shape material to conform to the utility being installed to ensure continuous firm bedding for full length of utility.

3.4 SUBGRADE PREPARATION
A. Beneath pavement and structures: Design subgrade surfaces shall be scarified to a depth of at least twelve inches, unless noted otherwise. The scarified soil shall be moisture-conditioned to attain soil moisture content necessary for required compaction. The scarified soil shall be compacted to 95% relative compaction per Paragraph 3.8 of this section. Prepared subgrades shall be proof rolled with a loaded dump truck or heavy compactor to verify proper density.

B. Control grading to prevent flow of water into subgrade areas.

C. Protect and maintain subgrades and repair any deficient subgrades prior to placing any materials on subgrade surfaces.

3.5 STABILIZATION OF EXCAVATIONS AND TRENCHES

A. The Contractor shall exercise sound engineering and construction practices for excavations and trenches and maintain them so that no damage will occur to any foundation, structure, pole line, pipe line, utility, paving or other facility because of sloughs or slopes, or from any other cause. If, as a result of the excavation or trenching, there is disturbance of the ground which may endanger such facilities or other property, or require repair, the Contractor shall take remedial action at no expense to the Owner.

B. The Contractor shall provide dewatering, shoring, and any other types of stabilization, in addition to the shoring required for safety by State codes, as required to maintain the integrity of the trench or excavation and protect nearby existing utilities and structures. All earthwork shall conform to the Washington Administrative Code (WAC) 296-155 requirements for Excavation, Trenching, and Shoring. If the Contractor elects to provide stabilization by open pit excavation or flatter side slopes, no additional compensation will be made for the work including excavation, imported backfill material, backfilling, and protection and restoration of existing facilities.

C. Provide, erect and maintain temporary support systems for existing utilities to remain during excavation work, or remove and replace utility and provide temporary bypassing during outage. Support systems shall allow affected utility to remain in service during excavation and backfill work, and shall prevent any movement of utility.

3.6 SITE GRADING

A. Should indicated elevations or figures conflict with proposed improvements, notify Engineer immediately for direction. Grade to within 1/20 foot of specified elevations.

B. Control grading to prevent flow of water into excavated areas and ponding.

C. Remove all concrete, rocks, rubble and debris larger than 1 inch on a side from surface of paving areas.

D. Grade to slopes indicated by proposed contours and elevations, and to provide positive drainage to storm drainage and/or TESC facilities. Localized low spots and rises will not be allowed except as indicated. Provide slope rounding and uniform transitions between areas of different slopes.

E. Protect and maintain finished surfaces. Allow no heavy objects to be moved over finish grade surfaces. Repair any ruts or holes in finished surfaces, and any obstructions to positive drainage. Repair areas showing settlement.

F. Grading within bioretention areas shall be performed by machines operating adjacent to the bioretention areas only. If equipment is necessary inside bioretention areas, use only Low Ground Pressure (6.5 PSI MAX) equipment in limited areas.
3.7 COMPACTION

A. Water settling or jetting will not be permitted as a means of compaction, unless noted otherwise. Compaction shall be achieved with power operated tampers, rollers, idlers, or vibratory equipment, except as follows:
   a. Use pneumatic hand tampers for trenches and areas not accessible to heavy equipment.

B. Material type, maximum uncompacted layer depth, relative compaction, and general application are specified in Table A below. Relative compaction is defined as the ratio of the in-place soil dry density to the maximum dry density as determined by the ASTM D1557-78 test method.

<table>
<thead>
<tr>
<th>Max. Uncompacted Layer Depth (in.)</th>
<th>Min. relative compaction (%)</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>95</td>
<td>Footing subgrade</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>Footing bearing pads</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>Footing and stemwall backfill</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>Slab-on-grade floor subgrade and subbase</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>Retaining wall subgrade</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>Retaining wall backfill</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>Concrete sidewalk subgrade</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>Asphalt pavement subgrade (upper 2 feet)</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>Utility trench backfill (more than 2’ below finish subgrade elevation)</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>Utility trench backfill (less than 2’ below finish subgrade elevation)</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>General site filling</td>
</tr>
</tbody>
</table>

3.8 HAULING AND STOCKPILING

A. Hauling and traffic patterns:
   1. When hauling is done over highways or city streets, the loads shall be trimmed and the vehicle shelf areas shall be cleaned after each loading. The loads shall be watered after trimming to minimize dust.
   2. Limit traffic patterns to areas which have been armored or otherwise protected to preserve the stability of the exposed soil and prevent erosion and sediment suspension in runoff from said areas.

B. Stockpiling:
   1. All stockpiles shall be covered. Proposed stockpile locations shall be coordinated with Owner. Submit stockpiling plan for approval and as accepted by Owner indicating locations and dimensions of proposed stockpiles, and obtain Owner approval prior to construction of stockpiles.
   2. Stockpiles shall be constructed in accordance with COLFP and WAC requirements. Side slopes shall be appropriate for the material to prevent sloughing, erosion, or instability.
   3. Stockpile covering shall consist of plastic sheeting. Staked sandbags or other means shall be provided to secure stockpile covering to surface of stockpile and prevent exposure of stockpiled materials to the elements, contamination with moisture, and erosion of stockpile materials.
3.9 FIELD QUALITY CONTROL

A. Conduct in-place field density tests on the compacted material to check for adequate moisture content and the required relative compaction. Where less than the required relative compaction is achieved, the soil shall be removed and replaced or the soil shall be moisture-conditioned and additional compactive effort applied as necessary until the relative compaction as specified in 3.7 of this Section is attained.

3.10 REMOVAL OF MATERIALS

A. Remove all material in excess of that required, all material not approved for use, and all unsuitable material, and legally dispose of off site.

END OF SECTION
SECTION 32 01 80 - OPERATION AND MAINTENANCE OF IRRIGATION

PART 1 - GENERAL

1.1 DESCRIPTION
A. This work consists of providing supervision, labor and materials to maintain all new irrigation systems during the one-year maintenance period. The maintenance contract shall begin at the date of Substantial Completion and terminate 365 days after.

1.2 EQUIPMENT
A. Maintain all equipment, tools and machinery while on the project in sufficient quantities and capacity for proper execution of the work.

1.3 RELATED WORK
A. Section 32 01 90, OPERATION AND MAINTENANCE OF PLANTING
B. Section 32 90 00, PLANTING

1.4 QUALITY ASSURANCE
A. Experience: Contractor's maintenance crew shall be experienced in maintaining irrigations systems. Minimum of 3 years of experience.
B. Contractor shall provide all irrigation maintenance equipment necessary for the contract.
C. Contractor shall submit monthly Report to the Owner’s Representative stating:
   1. Irrigation schedule including precipitation rates per zone, per month.
D. Begin soil moisture monitoring by April 1 to assure that plants are adequately watered at the beginning of the growing season in spring and continue through November 1.

1.5 SUBMITTALS
A. Submit in accordance with:
   Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Irrigation plan for vegetated roof plants developed by plant supplier
C. Monthly Report
PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.1 TREE, SHRUB, PERENNIAL AND GROUNDCOVER CARE

A. Watering:

1. All trees, shrubs, perennials, and groundcovers shall be watered by thorough deep watering at least every week during the dry season (May 15 to October 1), or as necessary, to keep the ground moist to a depth of at least 12 inches, to keep the plants healthy and vigorous, and to prevent wilting. Do not over water.

2. If hand watering, use a fine spray water wand, and water deeply.

3.2 IRRIGATION SYSTEM

A. Perform inspections at regular bi-monthly intervals to ensure the weather station and all other sensors are operational and connected to the central control system. Repair irrigation components immediately upon discovery of defects and keep operational at all times. Contractor shall provide supplemental hand watering if necessary.

B. Seasonal Shutdown and Start Up.

1. At the end of the watering season (typically in November) drain irrigation system by opening drain valves and blowing system out with compressed air. Shut down controller.

2. At the beginning of the watering season (typically in March) start up the irrigation system by closing all drain valves, refilling and pressurizing the system and reprogramming the controller.

3. Irrigation system to turned off after two years. Do not remove irrigation system. System can be turned on only during seasons of extreme drought for the remaining life of the project.

C. Watering Program:

1. In areas watered by an automatic irrigation system, program controls and maintain a record of watering program. Provide copies to Owner’s Representative.

2. Field monitor to ensure that the irrigation system is operating properly.
3.3 ON-SITE MEETINGS

A. Owner’s Representative and Contractor shall conduct an on-site review of irrigation maintenance work monthly during March – October, and bimonthly during remaining months. The Owner’s Representative shall provide written notification of corrections to work.

B. Replacement of stolen or vandalized irrigation equipment:
   1. Notify Owner’s Representative immediately of losses and damages, with follow-up report in writing. Owner’s Representative shall decide whether the replacement shall be done and by whom. The costs for replacement or repair other than as specified in irrigation routine maintenance shall be a reimbursable expense within the maintenance agreement.

3.4 SUBSTANTIAL COMPLETION AND FINAL INSPECTION

A. At completion of the contract period, the substantial completion inspection shall be performed by the Owner’s Representative and the Contractor. In this inspection, the irrigation system components and their operation will be reviewed and a punch list of any items needing correction will be prepared.

B. Final Inspection:
   1. Notify the Owner’s Representative at least three (3) days before anticipated inspection.
   2. Replace defective materials noted and upon completion of replacements, the Owner’s Representative will verify final acceptance in writing.

C. Instructions to Owner:
   1. Notify the Owner’s Representative to continue running the irrigation system through one growing season, in addition to the warrantee year.
   2. After two-year plant establishment irrigation is only to be turned on in extreme drought conditions.

END OF SECTION
SECTION 32 01 90 - OPERATION AND MAINTENANCE OF PLANTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This work consists of providing supervision, labor and materials to maintain all new landscaping during the maintenance period.

B. Duration: The maintenance period shall begin at the date of Substantial Completion and terminates as follows:

1. Plant Maintenance, which includes maintaining all installed plants, plant beds shall begin at the date of installation and terminate one year (365 days) after Substantial Completion.

1.2 EQUIPMENT

A. Maintain all equipment, tools and machinery while on the project in sufficient quantities and capacity for proper execution of the work.

1.3 RELATED WORK

A. Section 32 90 00, PLANTS

B. Section 32 01 80, OPERATION AND MAINTENANCE OF IRRIGATION

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer’s Product Literature for:

1. Fertilizer identifying manufacturer and showing composition by weight.

1.5 QUALITY ASSURANCE

A. Experience: Contractor's maintenance crew shall be experienced in landscape maintenance and shall have adequate knowledge of ornamental horticulture and integrated pest management (IPM) practices.

B. Unless approved by Owner’s Representative, herbicides, pre-emergent herbicides, and insecticides are not allowed for general weed and pest control. Before use of any herbicides, insecticides, or disease control chemicals, secure Owner’s Representative’s written approval.
Furnish the Owner’s Representative with a monthly record of all herbicides, insecticides and disease control chemicals used, if any.

C. Contractor shall provide all grounds maintenance equipment necessary for the contract.

D. Contractor shall submit a monthly letter report to the Owner’s Representative stating:

1. Schedule of maintenance activities completed

E. Begin soil moisture monitoring by April 1 to assure that plants are adequately watered at the beginning of the growing season in spring.

PART 2 - PRODUCTS

2.1 FERTILIZER:

A. 100% organic bridge-type fertilizer (part natural, part synthetic slow release) (7-4-9) as follows:
   - Total Nitrogen (N) 7%
     - 0.5% nitrate nitrogen (N)
     - 6.5% water insoluble nitrogen (N)
   - Available Phosphoric Acid (P2O5) 4%
   - Soluble Potash (K2O) 9%
   - Calcium 7%
   Shall be derived from: Fish meal, crab meal fines, kelp meal, fish bone meal, and agricultural gypsum.

PART 3 - EXECUTION

3.1 GENERAL LANDSCAPE MAINTENANCE

A. Frequency: Visit site once per week and provide the maintenance operations specified.

B. Watering: As specified in Section 32 01 80.

C. Trash Removal: Remove trash and debris from all pavement, planted areas, and lawns.

D. Weed Control: Keep planted areas and lawns free of weeds. Do not use broadcast herbicides. Remove weeds manually by pulling. Avoid frequent soil cultivation that destroys shallow roots of trees and shrubs.

E. Insect and disease control: Maintain a reasonable control with approved materials, using best management practices and least toxic methods.

1. Prior to use of any pesticide, submit written request for use, explaining reason for use, and proposed application, and obtain approval from Owner’s Representative.
F. Mulching: Replenish mulch in each planted area, with specified mulch for each respective area to maintain full depth as indicated in the specifications.
   1. See 32 90 00 Planting for mulch specifications

G. Replacement of Plants: Report dead and dying plants immediately to Owner’s Representative and replace within 30 days of notification by Owner’s Representative with plants of equal size, condition, and variety of original planting.

H. Leaf Removal: Remove fallen leaves from pavement, planted areas, and lawns once every two (2) weeks within the dates October 15 to December 15. Prior to and after this time period, leaf litter shall be removed from paved areas and surface drainage structures on a once per month basis.

I. Protection from Foraging: Implement measures to prevent damage to plants by browsing from mammals (deer, rabbits, mice, voles, etc.)

J. Irrigation: To be provided for two-year establishment period. Irrigation system to be shut down per Section 32 01 80 after two growing seasons.

3.2 SHRUB CARE

A. Re-set settled plants to proper grade and position. Restore planting saucer and adjacent material and remove dead material.

B. Pruning of Deciduous Trees: Prune trees during the dormant season to facilitate the following:
   1. To eliminate diseased or damaged growth.
   2. To encourage natural shape and balance

C. Pruning of Shrubs: Follow procedures as outlined for deciduous trees. Do not prune or shear shrubs into ball shapes, and do not prune off lower branches. Allow shrubs to spread and form masses to prevent weed growth below the shrubs.

D. Pruning Cuts: Make all cuts at lateral branches or buds, or trunk. Cut at the edge of the branch collar. Do not cut the collar.

E. Fertilization:
   1. Fertilize in two (2) applications - early spring and late spring, all recently established plants. Follow manufacturer's recommendations for application rate. Provide three (3) pounds of nitrogen per 1,000 square feet.
   2. Avoid applying fertilizer to root ball and base of main stem. Spread evenly under plant to drip line.
   3. DO NOT apply fertilizer, herbicides, or pesticides in or around rain gardens (bioretention facilities) and bioswales.
3.3 GROUND COVER AND PERENNIAL CARE
   A. Fertilize in two (2) applications, early spring and late spring. Follow manufacturer's recommendations for application rate. Provide a minimum of four (4) pounds of nitrogen per 1,000 square feet.
   B. Deadhead flowering perennials after each species finishes flowering. Clean up dead leaves and debris in the fall. Remove old, dying fern fronds and cut back deciduous ornamental grasses in early spring. Do not cut ornamental grasses in the fall or winter.

3.7 ON-SITE MEETINGS
   A. Owner’s Representative and Contractor shall conduct an on-site review of maintenance work monthly during March – October, and bimonthly during remaining months. The Owner’s Representative shall provide written notification of corrections to work.

3.8 REPLACEMENT OF STOLEN OR VANDALIZED PLANT MATERIAL
   A. Notify Owner’s Representative immediately of losses and damages, with follow-up report in writing. Owner’s Representative shall determine if plant losses are due to theft or vandalism. Contractor will not be held responsible for loss or damage to due to theft or vandalism.

3.9 SUBSTANTIAL COMPLETION AND FINAL INSPECTION
   A. At completion of the maintenance period, a substantial completion inspection shall be performed by the Owner’s Representative and the Contractor. In this meeting, a punch list of incomplete scope items needing to be addressed by the Contractor will be developed.
   B. Final Inspection:
      1. Notify the Owner’s Representative at least three (3) days before anticipated inspection.
      2. Replace defective materials noted and upon completion of replacements, the Owner’s Representative will verify final acceptance in writing.

END OF SECTION
SECTION 32 16 00
CURBS, SIDEWALKS AND DRIVEWAYS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to following:
   1. Furnishing and placing crushed surfacing.
   2. Provide cast in place cement concrete curb and walks on site and in City ROW as shown on the Project Drawings.
   3. Provide cement concrete driveway aprons in City ROW as shown on the Project Drawings.
   4. Providing cement concrete pavement for vehicular traffic.
   5. Providing cement concrete wheel stops where indicated on the Project Drawings.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Specifications, including but not limited to following:

   - Section 31 20 00 - Earthwork
   - Section 32 12 00 - Asphalt Concrete Pavement

1.3 REFERENCES

WSDOT-APWA 2018 Standard Specifications for Road, Bridge, and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.

COLFP City of Lake Forest Park Code and Engineering Development Manual and Standard Plans (King County Road Standards)

1.4 SUBMITTALS

A. Submit Certificates: Furnish certification in accordance with Section 00710 that all materials comply with Specification requirements; include laboratory test reports verifying compliance.
   1. Certified test results (no more than 6 months old at the time of submittal) that meet WSDOT-APWA.

B. Make all required submittals to COLFP and obtain all required approvals for paving work in ROW.

PART 2 PRODUCTS

2.1 CRUSHED SURFACING TOP COURSE

A. Crushed surfacing top course shall be per WSDOT-APWA.

2.2 CEMENT CONCRETE
A. Cement concrete for walks and curbs shall be air entrained concrete Class 3000 conforming to the requirements of WSDOT-APWA Section 6-02. Portland cement, aggregates, joint filler and curing materials shall conform to Section 8-14.2 of WSDOT-APWA.

B. Cement concrete for driveway aprons, concrete paving for vehicular traffic and ROW walks shall be air entrained concrete Class 4000 conforming to the requirements of WSDOT-APWA Section 6-02 and COLFP. Portland cement, aggregates, joint filler and curing materials shall conform to Section 8-14.2 of WSDOT-APWA.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes your acceptance of conditions as satisfactory.
   1. Verify proper compaction of subgrade, Section 312000, for on-grade work.

3.2 PREPARATION

A. Field Measurements:
   1. Carefully verify and coordinate with all COLFP requirements.
   2. Verify existing dimensions and shapes. Conform to existing where applicable.

3.3 INSTALLATION

A. Placement of top course shall comply with Section 4-04 of WSDOT-APWA. Degree of compaction shall be a minimum of 95 percent of maximum dry density as determined in accordance with ASTM D2922.

B. Install on site concrete curbs in accordance with plan drawings and WSDOT/APWA Sec. 8-04.3(1)A. Provide expansion joints at 10 foot spacing. Perform the work in a manner which results in a curb constructed to specified line and grade, uniform in appearance and structurally sound. Remove curbs found with unsightly bulges, ridges or other defects and replaced at Contractor's expense if Owner’s representative considers them irreparable. When checked with a 10-foot straightedge, grade shall not deviate more than 1/8 inch, and alignment shall not vary more than 1/4 inch. Curb repairs shall match existing grades.

C. Install on site cement concrete walkways in accordance with the plan drawings and WSDOT-APWA Section 8-14. Provide expansion (through) joints at 15 foot spacing unless noted otherwise. Install walkways flush with adjacent walks.

D. Install curbs, sidewalks and driveway apron in ROW per COLFP.

E. Spread the concrete for walks uniformly between the forms and compact thoroughly with a steel shod strikeboard. In construction of expansion (through) joints, adequately support the premolded joint filler until the concrete is placed on both sides of the joint.

F. Whenever castings are located in the sidewalk area, install joints at the casting location to control cracking of the sidewalk. If spacing of joints or scoring is such that installation of joint materials would be unsuitable, install rebar to strengthen the sidewalk section.

G. After the concrete has been thoroughly compacted and leveled, float with wood floats and finish at the
proper time with a metal float. Edge joints with a 1/4 inch radius edger and tool the sidewalk edges with a 1/2 inch radius edger.

H. Finish and score walks on site per the details in the plans. Finish and score sidewalks in ROW in accordance with COLFP.

I. Locations for expansion (through) joints for sidewalks are:
   1. To separate concrete driveways, stairways, columns, curb ramps and their landings from sidewalks.
   2. Around the vertical barrel of fire hydrants, around utility poles and large diameter underground utility cover castings when located in the sidewalk area.
   3. Longitudinally between concrete walks, curbs, paved planting strips and solid masonry or concrete walls where they abut.
   4. To match as nearly as possible, the through joints in the adjacent pavement and curb when sidewalk abuts curb.

J. Expansion (through) joints shall be ½-inch thickness premolded non-extruding joint material. Place with top edge 1/8 inch below the finished surface of the concrete, in a perpendicular plane to the surface. All joints shall be in straight alignment, except where placed in curved locations as required by the drawings.

K. Construction joints for sidewalks shall conform to the applicable requirements for through joints for pavement except for thickness of joint material being 3/16 inch and width of 2 inches. The top edge shall be 1/8 inch below the finished surface of the sidewalk. At no time will joint spacing exceed 15 feet.

3.4 FIELD QUALITY CONTROL

A. Coordinate with Section 01 43 00 and COLFP for ROW work.

3.5 CLEANING

A. Leave premises clean and free of residue of work of this Section.

END OF SECTION
PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes furnishing all materials and labor required for the design and construction of a precast concrete modular block (PMB) retaining wall with or without geosynthetic reinforcement. Precast modular block retaining wall blocks under this section shall be cast utilizing a wet-cast concrete mix and exhibit a final handling weight in excess of 1,000 pounds (450 kg) per unit.

B. Scope of Work: The work shall consist of furnishing materials, labor, equipment and supervision for the construction of a precast modular block (PMB) retaining wall structure in accordance with the requirements of this section and in acceptable conformity with the lines, grades, design and dimensions shown in the project site plans.

C. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 31, Division 32 and Division 33 also apply to this Section. SEE ALSO APPENDIX A FOR THE GEOTECHNICAL DESIGN MEMORANDUM dated October 29th, 2019.

1.02 PRICE AND PAYMENT PROCEDURES

A. Allowances. No allowance shall be made in the price of the retaining wall for excavation beyond the limits required for retaining wall construction as shown on the project plans. The cost of excavation for the purposes of site access shall be the responsibility of the General Contractor. Removal of unsuitable soils and replacement with select fill shall be as directed and approved in writing by the Owner or Owner’s representative and shall be paid under separate pay items.

B. Unit Prices. In addition to a lump sum price pursuant to completion of the scope of work described in Part 1.01 of this Section, the General Contractor shall provide a unit price per square foot of vertical wall face that shall be the basis of compensation for up to a ten (10) percent increase or reduction in the overall scope of the retaining wall work.

C. Measurement and Payment.
   1. The unit of measurement for furnishing the precast modular block retaining wall system shall be the vertical area of the wall face surface as measured from the top of the leveling pad to the top of the wall including coping. The final measured quantity shall include supply of all material components and the installation of the precast modular block system.
   2. The final accepted quantities of the precast modular block retaining wall system will be compensated per the vertical face area as described above. The quantities of the precast modular block retaining wall as shown on the plans and as approved by the Owner shall be the basis for determination of the final payment quantity. Payment shall be made per square foot of vertical wall face.
1.03 REFERENCES

A. Where the specification and reference documents conflict, the Owner’s designated representative will make the final determination of the applicable document.

B. Definitions:
2. Geotextile – a geosynthetic fabric manufactured for use as a separation and filtration medium between dissimilar soil materials.
3. Geogrid – a geosynthetic material comprised of a regular network of tensile elements manufactured in a mesh-like configuration of consistent aperture openings. When connected to the PMB facing units and placed in horizontal layers in compacted fill, the geogrid prevents lateral deformation of the retaining wall face and provides effective tensile reinforcement to the contiguous reinforced fill material.
4. Drainage Aggregate – clean, crushed stone placed within and immediately behind the precast modular block units to facilitate drainage and reduce compaction requirements immediately adjacent to and behind the precast modular block units.
5. Unit Core Fill – clean, crushed stone placed within the hollow vertical core of a precast modular block unit. Typically, the same material used for drainage aggregate as defined above.
6. Foundation Zone – soil zone immediately beneath the leveling pad and the reinforced zone.
7. Retained Zone – soil zone immediately behind the drainage aggregate and wall infill for wall sections designed as modular gravity structures. Alternatively, in the case of wall sections designed with geosynthetic soil reinforcement, the retained zone is the soil zone immediately behind the reinforced zone.
8. Reinforced Zone – structural fill zone within which successive horizontal layers of geogrid soil reinforcement have been placed to provide stability for the retaining wall face. The reinforced zone exists only for retaining wall sections that utilize geosynthetic soil reinforcement for stability.
9. Reinforced Fill – structural fill placed within the reinforced zone.
10. Leveling Pad – hard, flat surface upon which the bottom course of precast modular blocks are placed. The leveling pad may be constructed with crushed stone or cast-in-place concrete. A leveling pad is not a structural footing.
11. Wall Infill – the fill material placed and compacted between the drainage aggregate and the excavated soil face in retaining wall sections designed as modular gravity structures.

C. Reference Standards
1. Design
   d. FHWA-NHI-10-024 Volume I and GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes.
   e. FHWA-NHI-10-025 Volume II and GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes.
2. Precast Modular Block Units
   a. ACI 201 – Guide to Durable Concrete
   b. ACI 318 – Building Code Requirements for Structural Concrete
c.  ASTM C33 – Standard Specification for Concrete Aggregates

d.  ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens


h.  ASTM C150 – Standard Specification for Portland Cement

i.  ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.


m.  ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.


r.  ASTM C1116 – Standard Specification for Fiber-Reinforced Concrete.


t.  ASTM C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.


w.  ASTM C1776 – Standard Specification for Wet-Cast Precast Modular Retaining Wall Units.

x.  ASTM D6638 – Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks).

y.  ASTM D6916 – Standard Test Method for Determining Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks).

3. Geosynthetics


n.  ASTM D5321 – Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.
4. Soils
   a. AASHTO M 145 – AASHTO Soil Classification System.
   b. AASHTO T 104 – Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
   f. ASTM D448 – Standard Classification for Sizes of Aggregates for Road and Bridge Construction.
   g. ASTM D698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort. (12,400 ft-lbf/ft (2,700 kN-m/m)).
   i. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
   j. ASTM D1557 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort. (56,000 ft-lbf/ft (2,700 kN-m/m)).
   k. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
   r. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Aggregate by Nuclear Methods (Shallow Depth).

5. Drainage Pipe
b. ASTM F2648 – Standard Specification for 2 to 60 inch [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preconstruction Meeting. As directed by the Owner, the General Contractor shall schedule a preconstruction meeting at the project site prior to commencement of retaining wall construction. Participation in the preconstruction meeting shall be required of the General Contractor, Retaining Wall Design Engineer, Retaining Wall Installation Contractor, Grading Contractor and Inspection Engineer. The General Contractor shall provide notification to all parties at least 10 calendar days prior to the meeting.

1. Preconstruction Meeting Agenda:
   a. The Retaining Wall Design Engineer shall explain all aspects of the retaining wall construction drawings.
   b. The Retaining Wall Design Engineer shall explain the required bearing capacity of soil below the retaining wall structure and the shear strength of in-situ soils assumed in the retaining wall design to the Inspection Engineer.
   c. The Retaining Wall Design Engineer shall explain the required shear strength of fill soil in the reinforced, retained and foundation zones of the retaining wall to the Inspection Engineer.
   d. The Retaining Wall Design Engineer shall explain any measures required for coordination of the installation of utilities or other obstructions in the reinforced or retained fill zones of the retaining wall.
   e. The Retaining Wall Installation Contractor shall explain all excavation needs, site access and material staging area requirements to the General Contractor and Grading Contractor.

1.05 SUBMITTALS

A. Product Data. At least 14 days prior to construction, the General Contractor shall submit a minimum of six (6) copies of the retaining wall product submittal package to the Owner’s Representative for review and approval. The submittal package shall include technical specifications and product data from the manufacturer for the following:
   1. Precast Modular Block System brochure
   2. Precast Modular Block concrete test results specified in paragraph 2.01, subparagraph B of this section as follows:
      a. 28-day compressive strength
      b. Air content
      c. Slump or Slump Flow (as applicable)
   3. Drainage Pipe
   4. Geotextile
   5. Geosynthetic Soil Reinforcement (if required by the retaining wall design). The contractor shall provide certified manufacturer test reports for the geosynthetic soil reinforcement material in the manufactured roll width specified. The test report shall list the individual roll numbers for which the certified material properties are valid.

B. Installer Qualification Data. At least 14 days prior to construction, the General Contractor shall submit the qualifications of the business entity responsible for installation of the retaining wall, the Retaining Wall Installation Contractor, per paragraph 1.07, subparagraph A of this section.
C. Retaining Wall Design Calculations and Construction Shop Drawings. At least 14 days prior to construction, the General Contractor shall furnish six (6) sets of construction shop drawings and six (6) copies of the supporting structural calculations report to the Owner for review and approval. This submittal shall include the following:
   1. Signed, sealed and dated drawings and engineering calculations prepared in accordance with these specifications.
   2. Qualifications Statement of Experience of the Retaining Wall Design Engineer as specified in paragraph 1.07, subparagraph B of this section.
   3. Certificate of Insurance of the Retaining Wall Design Engineer as specified in paragraph 1.06, subparagraph B of this section.

1.06 CONSTRUCTION SHOP DRAWING PREPARATION

A. The Retaining Wall Design Engineer shall coordinate the retaining wall construction shop drawing preparation with the project Civil Engineer, project Geotechnical Engineer and Owner’s Representatives. The General Contractor shall furnish the Retaining Wall Design Engineer the following project information required to prepare the construction shop drawings. This information shall include, but is not limited to, the following:
   1. Current versions of the site, grading, drainage, utility, erosion control, landscape, and irrigation plans;
   2. electronic CAD file of the civil site plans listed in (1);
   3. report of geotechnical investigation and all addenda and supplemental reports;
   4. recommendations of the project Geotechnical Engineer regarding effective stress shear strength and total stress shear strength (when applicable) parameters for in-situ soils in the vicinity of the proposed retaining wall(s) and for any fill soil that may potentially be used as backfill in retained and/or foundation zones of the retaining wall.

B. The Retaining Wall Design Engineer shall provide the Owner with a certificate of professional liability insurance verifying the minimum coverage limits of $1 million per claim and $1 million aggregate.

C. Design of the precast modular block retaining wall shall satisfy the requirements of this section. Where local design or building code requirements exceed these specifications, the local requirements shall also be satisfied.

D. The Retaining Wall Design Engineer shall note any exceptions to the requirements of this section by listing them at the bottom right corner of the first page of the construction shop drawings.

E. Approval or rejection of the exceptions taken by the Retaining Wall Engineer will be made in writing as directed by the Owner.

F. The precast modular block design, except as noted herein, shall be based upon AASHTO Load and Resistance Factor Design (LRFD) methodology as referenced in paragraph 1.03, subparagraph C.1.

G. In the event that a conflict is discovered between these specifications and a reasonable interpretation of the design specifications and methods referenced in paragraph F above, these specifications shall prevail. If a reasonable interpretation is not possible, the conflict shall be resolved per the requirements in paragraph 1.03, subparagraph A of this section.
H. Soil Shear Parameters. The Retaining Wall Design Engineer shall prepare the construction shop drawings based upon soil shear strength parameters from the available project data and the recommendations of the project Geotechnical Engineer. If insufficient data exists to develop the retaining wall design, the Retaining Wall Design Engineer shall communicate the specific deficiency of the project information or data to the Owner in writing.

I. Allowable bearing pressure requirements for each retaining wall shall be clearly shown on the construction drawings.

J. Global Stability. Overall (global) stability shall be evaluated in accordance with the principals of limit equilibrium analysis as set forth in FHWA-NHI-10-024 Volume I and FHWA-NHI-10-025 Volume II GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes as referenced in paragraph 1.03, subparagraph C.1. The minimum factors of safety shall be as follows:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Factor of Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Service (Static)</td>
<td>1.4</td>
</tr>
<tr>
<td>Seismic</td>
<td>1.1</td>
</tr>
<tr>
<td>Rapid Drawdown (if applicable)</td>
<td>1.2</td>
</tr>
</tbody>
</table>

K. Seismic Stability. Seismic loading shall be evaluated in accordance with AASHTO Load and Resistance Factor Design (LRFD) methodology as referenced in paragraph 1.03, subparagraph C.1.

1.07 QUALITY ASSURANCE

A. Retaining Wall Installation Contractor Qualifications. In order to demonstrate basic competence in the construction of precast modular block walls, the Retaining Wall Installation Contractor shall document compliance with the following:

1. Experience.
   a. Construction experience with a minimum of 30,000 square feet (2,800 square meters) of the proposed precast modular block retaining wall system.
   b. Construction of at least ten (10) precast modular block (large block) retaining wall structures within the past three (3) years.
   c. Construction of at least 50,000 square feet (4,650 square meters) of precast modular block (large block) retaining walls within the past three (3) years.

2. Retaining Wall Installation Contractor experience documentation for each qualifying project shall include:
   a. Project name and location
   b. Date (month and year) of construction completion
   c. Contact information of Owner or General Contractor
   d. Type (trade name) of precast modular block system built
   e. Maximum height of the wall constructed
   f. Face area of the wall constructed

3. In lieu of the requirements set forth in items 1 and 2 above, the Retaining Wall Installation Contractor must be a certified Precast Modular Block Retaining Wall Installation Contractor as demonstrated by satisfactory completion of a certified precast modular block retaining wall installation training program administered by the precast modular block manufacturer.
B. Retaining Wall Design Engineer Qualifications and Statement of Experience. The Retaining Wall Design Engineer shall submit a written statement affirming that he or she has the following minimum qualifications and experience.

1. The Retaining Wall Design Engineer shall be licensed to practice in the jurisdiction of the project location.
2. The Retaining Wall Design Engineer shall be independently capable of performing all internal and external stability analyses, including those for seismic loading, compound stability, rapid draw-down and deep-seated, global modes of failure.
3. The Retaining Wall Design Engineer shall affirm in writing that he or she has personally supervised the design of the retaining walls for the project, that the design considers all the requirements listed in paragraph 1.06 and that he or she accepts responsibility as the design engineer of record for the retaining walls constructed on the project.
4. The Retaining Wall Design Engineer shall affirm in writing that he or she has personally designed in excess of 100,000 face square feet (9,000 face square meters) of modular block earth retaining walls within the previous three (3) years.
5. In lieu of these specific requirements, the engineer may submit alternate documentation demonstrating competency in Precast Modular Block retaining wall design.

C. The Owner reserves the right to reject the design services of any engineer or engineering firm who, in the sole opinion of the Owner, does not possess the requisite experience or qualifications.

1.08 QUALITY CONTROL

A. The Owner’s Representative shall review all submittals for materials, design, Retaining Wall Design Engineer qualifications and the Retaining Wall Installation Contractor qualifications.

B. The General Contractor shall retain the services of an Inspection Engineer who is experienced with the construction of precast modular block retaining wall structures to perform inspection and testing. The cost of inspection shall be the responsibility of the General Contractor. Inspection shall be continuous throughout the construction of the retaining walls.

C. The Inspection Engineer shall perform the following duties:

1. Inspect the construction of the precast modular block structure for conformance with construction shop drawings and the requirements of this specification.
2. Verify that soil or aggregate fill placed and compacted in the reinforced, retained and foundation zones of the retaining wall conforms with paragraphs 2.04 and 2.05 of this section and exhibits the shear strength parameters specified by the Retaining Wall Design Engineer.
3. Verify that the shear strength of the in-situ soil assumed by the Retaining Wall Design Engineer is appropriate.
4. Inspect and document soil compaction in accordance with these specifications:
   a. Required dry unit weight
   b. Actual dry unit weight
   c. Allowable moisture content
   d. Actual moisture content
   e. Pass/fail assessment
   f. Test location – wall station number
   g. Test elevation
h. Distance of test location behind the wall face
5. Verify that all excavated slopes in the vicinity of the retaining wall are bench-cut as directed by the project Geotechnical Engineer.
6. Notify the Retaining Wall Installation Contractor of any deficiencies in the retaining wall construction and provide the Retaining Wall Installation Contractor a reasonable opportunity to correct the deficiency.
7. Notify the General Contractor, Owner and Retaining Wall Design Engineer of any construction deficiencies that have not been corrected timely.
8. Document all inspection results.
9. Test compacted density and moisture content of the retained backfill with the following frequency:
   a. At least once every 1,000 square feet (90 square meters) (in plan) per 9-inch (230 mm) vertical lift, and
   b. At least once per every 18 inches (460 mm) of vertical wall construction.

D. The General Contractor’s engagement of the Inspection Engineer does not relieve the Retaining Wall Installation Contractor of responsibility to construct the proposed retaining wall in accordance with the approved construction shop drawings and these specifications.

E. The Retaining Wall Installation Contractor shall inspect the on-site grades and excavations prior to construction and notify the Retaining Wall Design Engineer and General Contractor if on-site conditions differ from the elevations and grading conditions depicted in the retaining wall construction shop drawings.

1.09 DELIVERY, STORAGE AND HANDLING

A. The Retaining Wall Installation Contractor shall inspect the materials upon delivery to ensure that the proper type, grade and color of materials have been delivered.

B. The Retaining Wall Installation Contractor shall store and handle all materials in accordance with the manufacturer’s recommendations as specified herein and in a manner that prevents deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, UV exposure or other causes. Damaged materials shall not be incorporated into the work.

C. Geosynthetics
   1. All geosynthetic materials shall be handled in accordance with ASTM D4873. The materials should be stored off the ground and protected from precipitation, sunlight, dirt and physical damage.

D. Precast Modular Blocks
   1. Precast modular blocks shall be stored in an area with positive drainage away from the blocks. Be careful to protect the block from mud and excessive chipping and breakage. Precast modular blocks shall not be stacked more than three (3) units high in the storage area.

E. Drainage Aggregate and Backfill Stockpiles
   1. Drainage aggregate or backfill material shall not be piled over unstable slopes or areas of the project site with buried utilities.
   2. Drainage aggregate and/or reinforced fill material shall not be staged where it may become mixed with or contaminated by poor draining fine-grained soils such as clay or silt.

PART 2 – MATERIALS
2.01 PRECAST MODULAR BLOCK RETAINING WALL UNITS

A. All units shall be wet-cast precast modular retaining wall units conforming to ASTM C1776.

B. All units for the project shall be obtained from the same manufacturer. The manufacturer shall be licensed and authorized to produce the retaining wall units by the precast modular block system patent holder/licensor and shall document compliance with the published quality control standards of the proprietary precast modular block system licensor for the previous three (3) years or the total time the manufacturer has been licensed, whichever is less.

C. Concrete used in the production of the precast modular block units shall be first-purpose, fresh concrete. It shall not consist of returned, reconstituted, surplus or waste concrete. It shall be an original production mix meeting the requirements of ASTM C94 and exhibit the properties as shown in the following table:
## Concrete Mix Properties

<table>
<thead>
<tr>
<th>Freeze Thaw Exposure Class&lt;sup&gt;(1)&lt;/sup&gt;</th>
<th>Minimum 28-Day Compressive Strength&lt;sup&gt;(2)&lt;/sup&gt;</th>
<th>Maximum Water Cement Ratio</th>
<th>Nominal Maximum Aggregate Size</th>
<th>Aggregate Class Designation&lt;sup&gt;(3)&lt;/sup&gt;</th>
<th>Air Content&lt;sup&gt;(4)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>4,000 psi (27.6 MPa)</td>
<td>0.45</td>
<td>1 inch (25 mm)</td>
<td>3M</td>
<td>4.5% +/- 1.5%</td>
</tr>
<tr>
<td>Severe</td>
<td>4,000 psi (27.6 MPa)</td>
<td>0.45</td>
<td>1 inch (25 mm)</td>
<td>3S</td>
<td>6.0% +/- 1.5%</td>
</tr>
<tr>
<td>Very Severe</td>
<td>4,500 psi (30.0 MPa)</td>
<td>0.40</td>
<td>1 inch (25 mm)</td>
<td>4S</td>
<td>6.0% +/- 1.5%</td>
</tr>
</tbody>
</table>

**Maximum Water-Soluble Chloride Ion (Cl<sup>-</sup>) Content in Concrete, Percent by Weight of Cement<sup>(5,6)</sup>:** 0.15

**Maximum Chloride as Cl<sup>-</sup> Concentration in Mixing Water, Parts Per Million:** 1000

**Maximum Percentage of Total Cementitious Materials By Weight<sup>(7,9)</sup> (Very Severe Exposure Class Only):**

- Fly Ash or Other Pozzolans Conforming to ASTM C618: 25
- Slag Conforming to ASTM C989: 50
- Silica Fume Conforming to ASTM C1240: 10
- Total of Fly Ash or Other Pozzolans, Slag, and Silica Fume<sup>(8)</sup>: 50
- Total of Fly Ash or Other Pozzolans and Silica Fume<sup>(8)</sup>: 35

**Alkali-Aggregate Reactivity Mitigation per ACI 201:**

<table>
<thead>
<tr>
<th>Slump (Conventional Concrete) per ASTM C143&lt;sup&gt;(10)&lt;/sup&gt;</th>
<th>5 inches +/- 1½ inches (125 mm +/- 40 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slump Flow (Self-Consolidating Concrete) per ASTM C1611</td>
<td>18 inches – 32 inches (450 mm – 800 mm)</td>
</tr>
</tbody>
</table>

<sup>(1)</sup>Exposure class is as described in ACI 318. “Moderate” describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. “Severe” describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture. “Very Severe” describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture and exposed to deicing chemicals. Exposure class should be specified by owner/purchaser prior to order placement.

<sup>(2)</sup>Test method ASTM C39.

<sup>(3)</sup>Defined in ASTM C33 Table 3 *Limits for Deleterious Substances and Physical Property Requirements of Coarse Aggregates for Concrete.*

<sup>(4)</sup>Test method ASTM C231.

<sup>(5)</sup>Test method ASTM C1218 at age between 28 and 42 days.

<sup>(6)</sup>Where used in high sulfate environments or where alkali-silica reactivity is an issue, water soluble chloride shall be limited to no more than trace amounts (from impurities in concrete-making components, not intended constituents.)

<sup>(7)</sup>The total cementitious material also includes ASTM C150, C595, C845, C1157 cement. The maximum percentages shall include:

- (a) Fly ash or other pozzolans in type IP, blended cement, ASTM C595, or ASTM C1157.
- (b) Slag used in the manufacture of an IS blended cement, ASTM C595, or ASTM C1157.
- (c) Silica fume, ASTM C1240, present in a blended cement.

<sup>(8)</sup>Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials.

<sup>(9)</sup>Prescriptive limits shown may be waived for concrete mixes that demonstrate excellent freeze/thaw durability in a detailed and current testing program.

<sup>(10)</sup>Slump may be increased by a high-range water-reducing admixture.
D. Each concrete block shall be cast in a single continuous pour without cold joints. With the exception of half-block units, corner units and other special application units, the precast modular block units shall conform to the nominal dimensions listed in the table below and be produced to the dimensional tolerances shown.

<table>
<thead>
<tr>
<th>Block Type</th>
<th>Dimension</th>
<th>Nominal Value</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>28&quot; (710 mm) Block</td>
<td>Height</td>
<td>18&quot; (457 mm)</td>
<td>+/- 3/16&quot; (5 mm)</td>
</tr>
<tr>
<td></td>
<td>Length</td>
<td>46-1/8&quot; (1172 mm)</td>
<td>+/- 1/2&quot; (13 mm)</td>
</tr>
<tr>
<td></td>
<td>Width*</td>
<td>28&quot; (710 mm)</td>
<td>+/- 1/2&quot; (13 mm)</td>
</tr>
<tr>
<td>41&quot; (1030 mm) Block</td>
<td>Height</td>
<td>18&quot; (457 mm)</td>
<td>+/- 3/16&quot; (5 mm)</td>
</tr>
<tr>
<td></td>
<td>Length</td>
<td>46-1/8&quot; (1172 mm)</td>
<td>+/- 1/2&quot; (13 mm)</td>
</tr>
<tr>
<td></td>
<td>Width*</td>
<td>40-1/2&quot; (1030 mm)</td>
<td>+/- 1/2&quot; (13 mm)</td>
</tr>
<tr>
<td>60&quot; (1520 mm) Block</td>
<td>Height</td>
<td>18&quot; (457 mm)</td>
<td>+/- 3/16&quot; (5 mm)</td>
</tr>
<tr>
<td></td>
<td>Length</td>
<td>46-1/8&quot; (1172 mm)</td>
<td>+/- 1/2&quot; (13 mm)</td>
</tr>
<tr>
<td></td>
<td>Width*</td>
<td>60&quot; (1520 mm)</td>
<td>+/- 1/2&quot; (13 mm)</td>
</tr>
</tbody>
</table>

* Block tolerance measurements shall exclude variable face texture

E. Individual block units shall have a nominal height of 18 inches (457 mm).

F. With the exception of half-block units, corner units and other special application units, the precast modular block units shall have two (2), circular dome shear knobs that are 10 inches (254 mm), 7.5 inches (190 mm), or 6.75 inches (171 mm) in diameter and 4 inches (102 mm) or 2 inches (51 mm) in height. The shear knobs shall fully index into a continuous semi-cylindrical shear channel in the bottom of the block course above. The peak interlock shear between any two (2) vertically stacked precast modular block units, with 10 inch (254 mm) diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 6,500 lb/ft (95 kN/m) at a minimum normal load of 500 lb/ft (7kN/m). as well as an ultimate peak interface shear capacity in excess of 11,000 lb/ft (160 kN/m). The peak interlock shear between any two (2) vertically stacked precast modular block units, with 7.5 inch (190 mm) or 6.75 inch (171 mm) diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 1,850 lb/ft (27 kN/m) at a minimum normal load of 500 lb/ft (7kN/m) as well as an ultimate peak interface shear capacity in excess of 10,000 lb/ft (146 kN/m). Test specimen blocks tested under ASTM D6916 shall be actual, full-scale production blocks of known compressive strength. The interface shear capacity reported shall be corrected for a 4,000 psi (27.6 MPa) concrete compressive strength. Regardless of precast modular block configuration, interface shear testing shall be completed without the inclusion of unit core infill aggregate.

G. The 28" (710 mm) and 41" (1030 mm) precast modular block units shall be cast with a 13" (330 mm) wide, continuous vertical core slot that will permit the insertion of a 12" (305 mm) inch wide strip of geogrid reinforcement to pass completely through the block. When installed in this manner, the geogrid reinforcement shall form a non-normal load dependent, positive connection between the block unit and the reinforcement strip. The use of steel for the purposes of creating the geogrid to block connection is not acceptable.

H. Without field cutting or special modification, the precast modular block units shall be capable of achieving a minimum radius of 14 ft 6 in (4.42 m).

I. The precast modular block units shall be manufactured with an integrally cast shear knobs that establishes a standard horizontal set-back for subsequent block courses. The precast modular block system shall be available in the four (4) standard horizontal set-back facing batter options listed below:

<table>
<thead>
<tr>
<th>Horizontal</th>
<th>Max.</th>
</tr>
</thead>
</table>
The precast modular block units shall be furnished with the required shear knobs that provide the facing batter required in the construction shop drawings.

J. The precast modular block unit face texture shall be selected by the owner from the available range of textures available from the precast modular block manufacturer. Each textured block facing unit shall be a minimum of 5.76 square feet (0.54 square meters) with a unique texture pattern that repeats with a maximum frequency of once in any 15 square feet (1.4 square meters) of wall face.

K. The block color shall be selected by the owner from the available range of colors available from the precast modular block manufacturer.

L. All precast modular block units shall be sound and free of cracks or other defects that would interfere with the proper installation of the unit, impair the strength or performance of the constructed wall. PMB units to be used in exposed wall construction shall not exhibit chips or cracks in the exposed face or faces of the unit that are not otherwise permitted. Chips smaller than 1.5” (38 mm) in its largest dimension and cracks not wider than 0.012” (0.3 mm) and not longer than 25% of the nominal height of the PMB unit shall be permitted. PMB units with bug holes in the exposed architectural face smaller than 0.75” (19 mm) in its largest dimension shall be permitted. Bug holes, water marks, and color variation on non-architectural faces are acceptable. PMB units that exhibit cracks that are continuous through any solid element of the PMB unit shall not be incorporated in the work regardless of the width or length of the crack.

M. Preapproved Manufacturers.

N. Substitutions. Technical information demonstrating conformance with the requirements of this specification for an alternative precast modular block retaining wall system must be submitted for preapproval at least 14 calendar days prior to the bid date. Acceptable alternative PMB retaining wall systems, otherwise found to be in conformance with this specification, shall be approved in writing by the owner 7 days prior to the bid date. The Owner’s Representative reserves the right to provide no response to submissions made out of the time requirements of this section or to submissions of block retaining wall systems that are determined to be unacceptable to the owner.

O. Value Engineering Alternatives. The owner may evaluate and accept systems that meet the requirements of this specification after the bid date that provide a minimum cost savings of 20% to the Owner. Construction expediency will not be considered as a contributing portion of the cost savings total.

2.02 GEOGRID REINFORCEMENT

A. Geogrid reinforcement shall be a woven or knitted PVC coated geogrid manufactured from high-tenacity PET polyester fiber with an average molecular weight greater than 25,000 (Mₐ > 25,000) and a carboxyl end group less than 30 (CEG < 30). The geogrid shall be furnished in prefabricated roll widths of certified tensile strength by the manufacturer. The prefabricated roll width of the geogrid shall be 12” (300 mm) +/- 1/2” (13
mm). No cutting of geogrid reinforcement down to the 12” (300 mm) roll width from a larger commercial roll width will be allowed under any circumstances.

B. The ultimate tensile strength (Tult) of the geogrid reinforcement shall be measured in accordance with ASTM D6637.

C. Geogrid – Soil Friction Properties
   1. Friction factor, F*, shall be equal to 2/3 Tan ϕ, where ϕ is the effective angle of internal friction of the reinforced fill soil.
   2. Linear Scale Correction Factor, α, shall equal 0.8.

D. Long-Term Tensile Strength (Tal) of the geogrid reinforcement shall be calculated in accordance with Section 3.5.2 of FHWA-NHI-10-024 and as provided in this specification.
   1. The creep reduction factor (RF_CR) shall be determined in accordance with Appendix D of FHWA-NHI-10-025 for a minimum 75 year design life.
   2. Minimum installation damage reduction factor (RF_ID) shall be 1.25. The value of RF_ID shall be based upon documented full-scale tests in a soil that is comparable to the material proposed for use as reinforced backfill in accordance with ASTM D5818.
   3. Minimum durability reduction factor (RF_D) shall be 1.3 for a soil pH range of 3 to 9.

E. Connection between the PMB retaining wall unit and the geogrid reinforcement shall be determined from short-term testing per the requirements of FHWA NHI-10-025, Appendix B.4 for a minimum 75-year design life.

F. The minimum value of Tal for geogrid used in design of a reinforced precast modular block retaining wall shall be 2,000 lb/ft (29 kN/m) or greater.

G. The minimum length of geogrid reinforcement shall be the greater of the following:
   1. 0.7 times the wall design height, H.
   2. 6 feet (1.83 m).
   3. The length required by design to meet internal stability requirements, soil bearing pressure requirements and constructability requirements.

H. Constructability Requirements. Geogrid design embedment length shall be measured from the back of the precast modular block facing unit and shall be consistent for the entire height of a given retaining wall section.

I. Geogrid shall be positively connected to every precast modular block unit. Design coverage ratio, Rc, as calculated in accordance with AASHTO LRFD Bridge Design Specifications Figure 11.10.6.4.1-2 shall not exceed 0.50.

J. Preapproved Geogrid Reinforcement Products.
   1. Miragrid XT Geogrids as manufactured by TenCate Geosynthetics of Pendergrass, Georgia USA and distributed by Manufacturers of the Redi-Rock Retaining Wall System.

K. Substitutions. No substitutions of geogrid reinforcement products shall be allowed.

2.03 GEOTEXTILE
A. Nonwoven geotextile fabric shall be placed as indicated on the retaining wall construction shop drawings. Additionally, the nonwoven geotextile fabric shall be placed in the v-shaped joint between adjacent block units on the same course. The nonwoven geotextile fabric shall meet the requirements Class 3 construction survivability in accordance with AASHTO M 288.

B. Preapproved Nonwoven Geotextile Products
   1. Mirafi 140N
   2. Propex Geotex 451
   3. Skaps GT-142
   4. Trace-Linq 140EX
   5. Carthage Mills FX-40HS
   6. Stratatex ST 142

2.04 DRAINAGE AGGREGATE AND WALL INFILL

A. Drainage aggregate (and wall infill for retaining walls designed as modular gravity structures) shall be a durable crushed stone conforming to No. 57 size per ASTM C33 with the following particle-size distribution requirements per ASTM D422:

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Size</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-½&quot; (38 mm)</td>
<td>100</td>
</tr>
<tr>
<td>1&quot; (25 mm)</td>
<td>95-100</td>
</tr>
<tr>
<td>½&quot; (13 mm)</td>
<td>25-60</td>
</tr>
<tr>
<td>No. 4 (4.76 mm)</td>
<td>0-10</td>
</tr>
<tr>
<td>No. 8 (2.38 mm)</td>
<td>0-5</td>
</tr>
</tbody>
</table>

2.05 REINFORCED FILL

A. Material used as reinforced backfill material in the reinforced zone (if applicable) shall be a granular fill material meeting the requirements of USCS soil type GW, GP, SW or SP per ASTM D2487 or alternatively by AASHTO Group Classification A-1-a or A-3 per AASHTO M 145. The backfill shall exhibit a minimum effective internal angle of friction, $\phi = 34$ degrees at a maximum 2% shear strain and meet the following particle-size distribution requirements per ASTM D422:

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Size</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; (19 mm)</td>
<td>100</td>
</tr>
<tr>
<td>No. 4 (4.76 mm)</td>
<td>0-100</td>
</tr>
<tr>
<td>No. 40 (0.42 mm)</td>
<td>0-60</td>
</tr>
<tr>
<td>No. 100 (0.15 mm)</td>
<td>0-10</td>
</tr>
<tr>
<td>No. 200 (0.07 mm)</td>
<td>0-15</td>
</tr>
</tbody>
</table>

B. The reinforced backfill material shall be free of sod, peat, roots or other organic or deleterious matter including, but not limited to, ice, snow or frozen soils. Materials passing the No. 40 (0.42 mm) sieve shall have a liquid limit less than 25 and plasticity index less than 6 per ASTM D4318. Organic content in the backfill material shall be less than 1% per AASHTO T-267 and the pH of the backfill material shall be between 5 and 8.
C. Soundness. The reinforced backfill material shall exhibit a magnesium sulfate soundness loss of less than 30% after four (4) cycles, or sodium sulfate soundness loss of less than 15% after five (5) cycles as measured in accordance with AASHTO T-104.

D. Reinforced backfill shall not be comprised of crushed or recycled concrete, recycled asphalt, bottom ash, shale or any other material that may degrade, creep or experience a loss in shear strength or a change in pH over time.

2.06 LEVELING PAD

A. The precast modular block units shall be placed on a leveling pad constructed from crushed stone or unreinforced concrete. The leveling pad shall be constructed to the dimensions and limits shown on the retaining wall design drawings prepared by the Retaining Wall Design Engineer.

B. Crushed stone used for construction of a granular leveling pad shall meet the requirements of the drainage aggregate and wall infill in section 2.04 or a preapproved alternate material.

C. Concrete used for construction of an unreinforced concrete leveling pad shall satisfy the criteria for AASHTO Class B. The concrete should be cured a minimum of 12 hours prior to placement of the precast modular block wall retaining units and exhibit a minimum 28-day compressive strength of 2,500 psi (17.2 MPa).

2.07 DRAINAGE

A. Drainage Pipe
   1. Drainage collection pipe shall be a 4” (100 mm) diameter, 3-hole perforated, HDPE pipe with a minimum pipe stiffness of 22 psi (152 kPa) per ASTM D2412.
   2. The drainage pipe shall be manufactured in accordance with ASTM D1248 for HDPE pipe and fittings.

B. Preapproved Drainage Pipe Products
   1. ADS 3000 Triple Wall pipe as manufactured by Advanced Drainage Systems.

PART 3 – EXECUTION

3.01 GENERAL

A. All work shall be performed in accordance with OSHA safety standards, state and local building codes and manufacturer’s requirements.

B. The General Contractor is responsible for the location and protection of all existing underground utilities. Any new utilities proposed for installation in the vicinity of the retaining wall, shall be installed concurrent with retaining wall construction. The General Contractor shall coordinate the work of subcontractors affected by this requirement.

C. New utilities installed below the retaining wall shall be backfilled and compacted to a minimum of 98% maximum dry density per ASTM D698 standard proctor.
D. The General Contractor is responsible to ensure that safe excavations and embankments are maintained throughout the course of the project.

E. All work shall be inspected by the Inspection Engineer as directed by the Owner.

3.02 EXAMINATION

A. Prior to construction, the General Contractor, Grading Contractor, Retaining Wall Installation Contractor and Inspection Engineer shall examine the areas in which the retaining wall will be constructed to evaluate compliance with the requirements for installation tolerances, worker safety and any site conditions affecting performance of the completed structure. Installation shall proceed only after unsatisfactory conditions have been corrected.

3.03 PREPARATION

A. Fill Soil.

1. The Inspection Engineer shall verify that reinforced backfill placed in the reinforced soil zone satisfies the criteria of this section.

2. The Inspection Engineer shall verify that any fill soil installed in the foundation and retained soil zones of the retaining wall satisfies the specification of the Retaining Wall Design Engineer as shown on the construction drawings.

B. Excavation.

1. The Grading Contractor shall excavate to the lines and grades required for construction of the precast modular block retaining wall as shown on the construction drawings. The Grading Contractor shall minimize over-excavation. Excavation support, if required, shall be the responsibility of the Grading Contractor.

2. Over-excavated soil shall be replaced with compacted fill in conformance with the specifications of the Retaining Wall Design Engineer and “Division 31, Section 31 20 00 – Earthmoving” of these project specifications.

3. Embankment excavations shall be bench cut as directed by the project Geotechnical Engineer and inspected by the Inspection Engineer for compliance.

C. Foundation Preparation.

1. Prior to construction of the precast modular block retaining wall, the leveling pad area and undercut zone (if applicable) shall be cleared and grubbed. All topsoil, brush, frozen soil and organic material shall be removed. Additional foundation soils found to be unsatisfactory beyond the specified undercut limits shall be undercut and replaced with approved fill as directed by the project Geotechnical Engineer. The Inspection Engineer shall ensure that the undercut limits are consistent with the requirements of the project Geotechnical Engineer and that all soil fill material is properly compacted according project specifications. The Inspection Engineer shall document the volume of undercut and replacement.

2. Following excavation for the leveling pad and undercut zone (if applicable), the Inspection Engineer shall evaluate the in-situ soil in the foundation and retained soil zones.

a. The Inspection Engineer shall verify that the shear strength of the in-situ soil assumed by the Retaining Wall Design Engineer is appropriate. The Inspection Engineer shall immediately stop work and notify the Owner if the in-situ shear strength is found to be inconsistent with the retaining wall design assumptions.
b. The Inspection Engineer shall verify that the foundation soil exhibits sufficient ultimate bearing capacity to satisfy the requirements indicated on the retaining wall construction shop drawings per paragraph 1.06 I of this section.

D. Leveling Pad.
1. The leveling pad shall be constructed to provide a level, hard surface on which to place the first course of precast modular block units. The leveling pad shall be placed in the dimensions shown on the retaining wall construction drawings and extend to the limits indicated.
2. Crushed Stone Leveling Pad. Crushed stone shall be placed in uniform maximum lifts of 6” (150 mm). The crushed stone shall be compacted by a minimum of 3 passes of a vibratory compactor capable of exerting 2,000 lb (8.9 kN) of centrifugal force and to the satisfaction of the Inspection Engineer.
3. Unreinforced Concrete Leveling Pad. The concrete shall be placed in the same dimensions as those required for the crushed stone leveling pad. The Retaining Wall Installation Contractor shall erect proper forms as required to ensure the accurate placement of the concrete leveling pad according to the retaining wall construction drawings.

3.04 PRECAST MODULAR BLOCK WALL SYSTEM INSTALLATION

A. The precast modular block structure shall be constructed in accordance with the construction drawings, these specifications and the recommendations of the retaining wall system component manufacturers. Where conflicts exist between the manufacturer’s recommendations and these specifications, these specifications shall prevail.

B. Drainage components. Pipe, geotextile and drainage aggregate shall be installed as shown on the construction shop drawings.

C. Precast Modular Block Installation
1. The first course of block units shall be placed with the front face edges tightly abutted together on the prepared leveling pad at the locations and elevations shown on the construction drawings. The Retaining Wall Installation Contractor shall take special care to ensure that the bottom course of block units are in full contact with the leveling pad, are set level and true and are properly aligned according to the locations shown on the construction drawings.
2. Backfill shall be placed in front of the bottom course of blocks prior to placement of subsequent block courses. Nonwoven geotextile fabric shall be placed in the V-shaped joints between adjacent blocks. Drainage aggregate shall be placed in the V-shaped joints between adjacent blocks to a minimum distance of 12” (300 mm) behind the block unit.
3. Drainage aggregate shall be placed in 9 inch maximum lifts and compacted by a minimum of three (3) passes of a vibratory plate compactor capable exerting a minimum of 2,000 lb (8.9 kN) of centrifugal force.
4. Unit core fill shall be placed in the precast modular block unit vertical core slot. The core fill shall completely fill the slot to the level of the top of the block unit. The top of the block unit shall be broom-cleaned prior to placement of subsequent block courses. No additional courses of precast modular blocks may be stacked before the unit core fill is installed in the blocks on the course below.
5. Base course blocks for gravity wall designs (without geosynthetic soil reinforcement) may be furnished without vertical core slots. If so, disregard item 4 above, for the base course blocks in this application.
6. Nonwoven geotextile fabric shall be placed between the drainage aggregate and the retained soil (gravity wall design) or between the drainage aggregate and the reinforced fill (reinforced wall design) as required on the retaining wall construction drawings.
7. Subsequent courses of block units shall be installed with a running bond (half block horizontal course-to-course offset). With the exception of 90 degree corner units, the shear channel of the upper block shall be fully engaged with the shear knobs of the block course below. The upper block course shall be pushed forward to fully engage the interface shear key between the blocks and to ensure consistent face batter and wall alignment. Geogrid, drainage aggregate, unit core fill, geotextile and properly compacted backfill shall be complete and in-place for each course of block units before the next course of blocks is stacked.

8. The elevation of retained soil fill shall not be less than 1 block course (18” (457 mm)) below the elevation of the reinforced backfill throughout the construction of the retaining wall.

9. If included as part of the precast modular block wall design, cap units shall be secured with an adhesive in accordance with the precast modular block manufacturer’s recommendation.

D. Geogrid Reinforcement Installation (if required)
1. Geogrid reinforcement shall be installed at the locations and elevations shown on the construction drawings on level fill compacted to the requirements of this specification.
2. Continuous 12” (300 mm) wide strips of geogrid reinforcement shall be passed completely through the vertical core slot of the precast modular block unit and extended to the embedment length shown on the construction plans. The strips shall be staked or anchored as necessary to maintain a taut condition.
3. Reinforcement length (L) of the geogrid reinforcement is measured from the back of the precast modular block unit. The cut length (Lc) is two times the reinforcement length plus additional length through the block facing unit. The cut length is calculated as follows:

\[
L_c = 2L + 3 \text{ ft} \quad (2L + 0.9 \text{ m}) \quad (28” (710 \text{ mm}) \text{ block unit})
\]

\[
L_c = 2L + 5 \text{ ft} \quad (2L + 1.5 \text{ m}) \quad (41” (1030 \text{ mm}) \text{ block unit})
\]

4. The geogrid strip shall be continuous throughout its entire length and may not be spliced. The geogrid shall be furnished in nominal, prefabricated roll widths of 12” (300 mm) +/- ½” (13 mm). No field modification of the geogrid roll width shall be permitted.

5. Neither rubber tire nor track vehicles may operate directly on the geogrid. Construction vehicle traffic in the reinforced zone shall be limited to speeds of less than 5 mph (8 km/hr) once a minimum of 9 inches (230 mm) of compacted fill has been placed over the geogrid reinforcement. Sudden braking and turning of construction vehicles in the reinforced zone shall be avoided.

E. Construction Tolerance. Allowable construction tolerance of the retaining wall shall be as follows:
1. Deviation from the design batter and horizontal alignment, when measured along a 10’ (3 m) straight wall section, shall not exceed 3/4” (19 mm).
2. Deviation from the overall design batter shall not exceed 1/2” (13 mm) per 10’ (3 m) of wall height.
3. The maximum allowable offset (horizontal bulge) of the face in any precast modular block joint shall be 1/2” (13 mm).
4. The base of the precast modular block wall excavation shall be within 2” (50 mm) of the staked elevations, unless otherwise approved by the Inspection Engineer.
5. Differential vertical settlement of the face shall not exceed 1’ (300 mm) along any 200’ (61 m) of wall length.
6. The maximum allowable vertical displacement of the face in any precast modular block joint shall be 1/2” (13 mm).
7. The wall face shall be placed within 2” (50 mm) of the horizontal location staked.
A. Backfill material placed immediately behind the drainage aggregate shall be compacted as follows:
   1. 98% of maximum dry density at ± 2% optimum moisture content per ASTM D698 standard proctor or
      85% relative density per ASTM D4254.

B. Compactive effort within 3’ (0.9 m) of the back of the precast modular blocks should be accomplished with
   walk-behind compactors. Compaction in this zone shall be within 95% of maximum dry density as measured
   in accordance with ASTM D698 standard proctor or 80% relative density per ASTM D 4254. Heavy
   equipment should not be operated within 3’ (0.9 m) of the back of the precast modular blocks.

C. Backfill material shall be installed in lifts that do not exceed a compacted thickness of 9” (230 mm).

D. At the end of each work day, the Retaining Wall Installation Contractor shall grade the surface of the last lift
   of the granular wall infill to a 3% ± 1% slope away from the precast modular block wall face and compact it.

E. The General Contractor shall direct the Grading Contractor to protect the precast modular block wall structure
   against surface water runoff at all times through the use of berms, diversion ditches, silt fence, temporary
   drains and/or any other necessary measures to prevent soil staining of the wall face, scour of the retaining wall
   foundation or erosion of the reinforced backfill or wall infill.

3.06 OBSTRUCTIONS IN THE INFILL AND REINFORCED FILL ZONE

A. The Retaining Wall Installation Contractor shall make all required allowances for obstructions behind and
   through the wall face in accordance with the approved construction shop drawings.

B. Should unplanned obstructions become apparent for which the approved construction shop drawings do not
   account, the affected portion of the wall shall not be constructed until the Retaining Wall Design Engineer can
   appropriately address the required procedures for construction of the wall section in question.

3.07 COMPLETION

A. For walls supporting unpaved areas, a minimum of 12” (300 mm) of compacted, low-permeability fill shall be
   placed over the granular wall infill zone of the precast modular block retaining wall structure. The adjacent
   retained soil shall be graded to prevent ponding of water behind the completed retaining wall.

B. For retaining walls with crest slopes of 5H:1V or steeper, silt fence shall be installed along the wall crest
   immediately following construction. The silt fence shall be located 3’ to 4’ (0.9 m to 1.2 m) behind the
   uppermost precast modular block unit. The crest slope above the wall shall be immediately seeded to
   establish vegetation. The General Contractor shall ensure that the seeded slope receives adequate irrigation
   and erosion protection to support germination and growth.

C. The General Contractor shall confirm that the as-built precast modular block wall geometries conform to the
   requirements of this section. The General Contractor shall notify the Owner of any deviations.

END OF SECTION 32 32 16
PART 1 - GENERAL

1.1 SUMMARY

A. A central-controlled, automatically controlled irrigation system, complete, including piping, backflow preventer, valve boxes, controls, control wiring, fittings, electrical connections and necessary accessories to provide 100% coverage in areas as indicated in the DRAWINGS.

1.2 RELATED WORK

A. Related Work Specified Elsewhere: Coordinate related work specified in other parts of the Project Specifications, including but not limited to the following:

1. Division 00 – Procurement and Contracting Requirements
2. Division 01 – General Requirements
3. Division 03 – Concrete
4. Division 22 – Plumbing
5. Division 26 – Electrical
6. Division 31 – Earthwork
7. Division 32 – Exterior Improvements
   a. Section 32 01 80 – Operation and Maintenance of Irrigation
   b. Section 32 84 13 – Drip Irrigation
   c. Section 32 90 00 - Planting
8. Division 33 - Utilities

1.3 REFERENCES

A. American National Standard Institute (ANSI):
   1. B40.1-98: Gauges-Pressure Indicating Dial Type-Elastic Element

B. American Society of Sanitary Engineers (ASSE):
   1. 1013-2005: Reduced Pressure Principle Backflow Preventers

C. American Society for Testing and Materials (ASTM):
   1. B61-02: Steam or Valve Bronze Castings
2. B62-02: Composition Bronze or Ounce Metal Castings
3. D1785-04a: Poly Vinyl Chloride (PVC) Plastic Pipe, Schedule 40, 80, and 120
4. D2241-04b: Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
5. D2241-04b: Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
11. F477-02e1: Elastomeric Seals (Gaskets) for Joining Plastic Pipe

D. American Water Works Association (AWWA):
   2. C500-02: Metal-seated Gate Valves for Water Supply Service C504-00 Rubber Seated Butterfly Valves
   3. C600-99: Installation of Ductile-Iron Water Mains and Their Appurtenances

E. National Electrical Manufacturers Association (NEMA):
   1. 250-2003: Enclosures for Electrical Equipment (1000 Volts Maximum)

F. National Fire Protection Agency
   1. NFPA 780: Standard for the Installation of Lightning Protection Systems

1.4 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Submit as one package in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
C. Manufacturers' Literature and Data:
   1. Piping
   2. Jointing materials
3. Valves (all applications)
4. Backflow preventers
5. Valve boxes
6. Frames and covers
7. Pressure reducing valve
8. Pressure gauges
9. Automatic control equipment
10. Weather monitoring system receiver and enclosure
11. Valve boxes and vaults
12. Wire splices

D. Complete detailed layout shop drawings covering design of system showing pipe sizes and lengths; controls; backflow preventers; valves; drainage pits; location and mounting details of electrical control equipment; complete wiring diagram showing routes and wire sizes; wiring details and source of current and connections to existing services. Do not start work before final shop drawing approval.

E. Name and address of a permanent service organization maintained or trained by the manufacturers that will render satisfactory service within eight hours of receipt of notification that service is requested.

F. Reproducible "as-built" drawings submitted at completion of installation

G. After "as-built" drawings have been approved, submit print of controller chart.

H. Irrigation schedule including runtimes and dates for each valve.

1.3 QUALITY ASSURANCE

A. Criteria:
1. Manufacturer shall be one who regularly and presently manufactures the item submitted as one of their principal products.
2. There is a permanent service organization, maintained or trained by the manufacturer, which will render satisfactory service within eight hours of receipt of notification that service is requested.
3. Installer, or supplier of a service, has technical qualifications, experience, and trained personnel and facilities to perform the specified work.

B. Products Criteria:
1. **Multiple Units:** When two or more units of the same type or class of materials or equipment are required, these units are products of one manufacturer.

2. **Assembled Units:** Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
   
   a. All components of an assembled unit need not be products of the same manufacturer but component parts which are alike are the product of a single manufacturer.
   
   b. Components are compatible with each other and with the total assembly for the intended service.

3. **Nameplates:** Nameplate bearing manufacturer's name or identification trademark securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

C. **System Requirements:**

1. Full and complete coverage is required. Contractor shall, at no additional cost to the Owner, make necessary adjustments to layout required to achieve full, uniform coverage of irrigated areas without overthrow on roadways, sidewalks, window wells, or buildings and to protect trees from close high spray velocity.

2. Layout work as closely as possible to drawings. Drawings are diagrammatic to the extent that swing joints, offsets and all fittings are not shown. Lines are to be common trenched wherever possible. All irrigation components shall be installed in the landscape areas, except where noted to be sleeved under pavement and structures.

3. Locations of remote-control valves is schematic. Remote control valves shall be grouped wherever possible and aligned at a set dimension from back of curb along roads.

4. Irrigation lines and control wire shall run through designated utility lanes or beside roadways where possible.

D. **Maintenance and Operating Instructions:** Prior to final acceptance, verbal instructions, for a period of not less than 8 hours, shall be provided to the operating personnel. Provide two additional years of software support for one hour each month. Provide manuals as specified in Division 1, GENERAL REQUIREMENTS.

E. Completely program controller and satellites according to approved irrigation schedule.

F. Follow manufacturer's instructions for installation.

G. Manufacturer of Control Systems to certify Control System is complete, including all related components, and totally operational. Submit certificate to Owner’s Representative.

H. **As-Built Record Drawings:** Maintain a complete set of as-built drawings which shall be corrected daily to show changes in locations of all pipe, valves, pumps and related irrigation equipment. Valves shall be shown with dimensions to reference points.

I. Controller Chart:
1. Prepare a map diagram showing location of all valves, lateral lines, and route of the control wires. Identify all valves as to size, station, number and type of irrigation. "As-built" drawings must be approved before charts are prepared.

2. Provide one controller chart showing the area covered by controller for each automatic controller supplied at the maximum size controller door will allow. Chart shall be a reduced drawing of the actual "as-built" system. If controller sequence is not legible when the drawing is reduced to door size, the drawing shall be enlarged to a size that is readable and placed folded, in a sealed plastic container, inside the controller door.

3. Chart shall be a blackline print with a different color used to show area of coverage for each station. Charts must be completed and approved prior to final inspection of the irrigation system. For Water

PART 2 - PRODUCTS

2.01 PIPING

A. Irrigation Mains: Provide one of the following materials.

1. Polyvinyl Chloride (PVC) Pressure Pipe, AWWA C900, PVC 1120, working pressure 150 psi. Pipe shall conform to outside diameters of AWWA 151

B. Irrigation Laterals: Polyvinyl Chloride, ASTM D2241, PVC Class 200 1120, SDR 21, solvent welded.

C. Threaded Pipe: Polyvinyl Chloride, ASTM D1785, PVC 1120, Schedule 80, for threaded connections, risers and swing joints.

D. Above Grade and in Mechanical Pits: AWWA C115, flanged joints and fittings working pressure 150 psi.

E. Fittings:

1. Irrigation Mains: PVC Pipe, gasketed fittings, ASTM D2466:

2. Irrigation Laterals: PVC, class 200, solvent welded socket type, ASTM D2466.

3. Threaded Pipe: PVC, schedule 80, ASTM D2466.

4. Swing Joints: Threaded fittings with elastomeric seals that allow 360 degree rotation and designed for minimum 1375 kPa (200 psig) working pressure, may be used in lieu of standard threaded fittings.

F. Jointing Materials:

1. Irrigation Mains: Rubber gaskets, AWWA C111.

2. Irrigation Laterals: Solvent cement, ASTM D2564.
2.02 VALVES (EXCEPT AUTOMATIC CONTROL VALVES)

A. Underground Shut-Off Valves: Provide One of the Following:

1. Angle valves (for isolation valves 2” and smaller)
2. Ball valves (for isolation valves 1-1/2” and smaller): Full-port ball valves with bronze body, PTFE seats, and 90 degree on/off handle. Ball valves to have NPT female end connections.

B. Operations:

1. Underground: furnish valves with 50 mm (2 inch) nut for T-Handle socket wrench operation. Furnish 3 T handle wrenches in length suitable for operation.
2. Above ground and in pits: MSS SP70, with handwheels.
3. Ends of valves shall accommodate the type of pipe installed.

C. Check: Swing.

1. Smaller than 100 mm (4 inches): Bronze body and bonnet, ASTM B61 or B62, 850 kPa (125 pound) WSP.

D. Pressure Reducing Valve

1. As needed, see Specification 32 84 13 – Rain Bird Landscape Drip Irrigation

2.03 VALVE BOXES AND ENCLOSURES

A. Gate and Isolation Valves:

1. Valve boxes shall be cast iron 2-piece roadway boxes. Box shall be of such length to be adapted to depth of cover required over pipe at valve location. Mark box cover with the word “IRRIGATION” and set flush with finished grade.

a. Provide three (3) "T" handle socket wrenches of 15 mm (5/8 inch) round stock with sufficient length to extend 600 mm (2 feet) above top of deepest valve box cover.

2. In lawn and planter areas, valve boxes shall be HDPE structural foam Type A, Class III. Box shall be minimum 475 mm (19 inches) long by 350 mm (14 inches) deep with key-lockable cover.

a. In lawn areas box and lid color: green.
   b. In plant bed areas box and lid color: tan

B. Automatic Control Valves, Master Valve, and Flow Sensor:

1. When in pavement, valve boxes shall be precast concrete (from Rigid Cast Iron Forms) with compressive strength of the concrete in excess of 30 MPa (4000 psi) with matching lid.
2. In lawn and planter areas, valve boxes shall be HDPE structural foam Type A, Class III. Box shall be minimum 475 mm (19 inches) long by 350 mm (14 inches) deep with key-lockable cover.
   a. In lawn areas box and lid color: green.
   b. In plant bed areas box and lid color: tan

3. After installation, label boxes with two 80 mm (3 inch) size stencils designated controller and circuit numbers with permanent white epoxy paint. Numbers shall be placed at center of valve cover and shall face nearest main road or service road.

4. Furnish three (3) 750 mm (30 inch) long valve adjustment keys.

C. Backflow Preventer Enclosures:
   1. Double Check Valve Backflow Preventer Enclosure:
      a. Model: BP-1 Green
      b. Description: Backflow Protector Cage
      c. Size: 22”L x 10”W x 24”H
      d. Color: Green

2.04 BACKFLOW PREVENTER

A. The backflow prevention device shall be certified to NSF/ANSI 372 shall be ASSE Listed 1013, rated from 32-degree F to 140-degree F, and supplied with full port ball valves.

B. The main body and access covers shall be low lead bronze (ASTM B 584)

C. The seat ring and all internal polymers shall be NSF Listed Noryl and the seat disc elastomers shall be silicone.

D. Backflow Preventer shall be as indicated on the drawings.

2.05 FLOW SENSOR

A. In line flow sensor which monitors for low flow and excess flow conditions caused by broken lines or emitters. Sensor shall automatically quarantine and shuts down the problem area and continue to irrigate non affected areas.

1. Flow sensor to be from same manufacturer as irrigation controller weather monitoring system.

2. Flow sensor sized to manage 160 gpm flow.

2.06 AUTOMATIC CONTROLLER EQUIPMENT

A. The Control System components and software shall be a standard package from a single manufacturer.

B. Independent controller shall be configurable for up to 12 stations, have central control capability, and shall have the following characteristics:
   1. The controller shall be furnished with a built-in remote-control capability.
2. The controller shall be furnished with a rain switch that automatically turns off all stations without disturbing the program.

3. The controller shall be UL and C-UL approved.

4. The controller shall include the following features:
   a. Six independent and four custom programs
   b. Ten start times per program
   c. System water use tracking
   d. Programable rain delay
   e. Cycle and soak feature
   f. Flow monitoring
   g. Electrical input 120/240 VAC, 50/60 Hz
   h. Transformer output 24 VAC, 4.0A
   i. Station output 24 VAC 0.56A
   j. Four sensor inputs including flow sensor
   k. Controller to be upgradable for central control applications

2.07 WEATHER MONITORING SYSTEM

A. The weather monitoring system shall consist of a Controller Pedestal mounted sensor which collect weather information.

1. Sensor shall have a rain switch and freeze sensor that shuts system off when temperatures fall below 37 degrees Fahrenheit.

2. Sensor shall be 25’ of 20 AWG sheathed, two conductor, UL approved wire or wireless connection with up to 800 ft. range from wireless sensor to receiver
   a. Switch rating: 24 VAC, 3A
   b. System operating frequency: 433 MHz

3. Sensor shall be UL listed and FCC approved

2.08 GROUNDING RODS

A. Copper clad grounding rods meeting NFPA 780 requirements.

2.09 AUTOMATIC CONTROL VALVE: DRIP SYSTEM

A. See Specification 328413

2.10 LOW VOLTAGE CONTROL VALVE WIRE

A. Wire: Solid copper wire, Underwriters Laboratories Inc. approved for direct burial in ground. Size of wire shall be in accordance with manufacturer's recommendations, but in no case less than No. 14.
2.11 SPlicing MATERIALS: EPOXY WATERPROOF SEALING PACKET. LOW VOLTAGE CONTROLLER CABLE

A. Molded waterproof and UV resistant tube with wire nuts and silicon or resin sealer, Underwriters Laboratories Inc. approved for direct burial in ground.

2.12 SLEEVE MATERIAL

A. PVC-1120-5DR 17, Schedule 80.

2.13 WARNING TAPE

A. Standard, 4-Mil polyethylene 76 mm (3 inch) wide tape, detectable type blue with black letters and imprinted with “CAUTION BURIED IRRIGATION WATER LINE BELOW”.

B. Tracer Wires

1. No. 14, Green, Type TW plastic-coated copper tracer wire shall be installed with non-metallic irrigation main lines.

PART 3 - EXECUTION

3.01 PIPE LAYING - GENERAL

A. Do not lay pipe on unstable material, in wet trench or when, in the opinion of Owner’s Representative, trench or weather conditions are unsuitable for the work.

B. Allow a minimum of 3 inches between parallel pipes in the same trench.

C. Hold pipe securely in place while joint is being made.

D. Do not work over, or walk on, pipe in trenches until covered by layers of earth well tamped in place to a depth of 12 inches over pipe.

E. Full length of each section of pipe shall rest upon the pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipe on wood blocking.

F. Install irrigation lines to avoid heating trenches, electric ducts, storm and sanitary sewer lines, and existing water and gas mains, all of which have right of way.

G. Clean interior of pipe of foreign matter before installation. Keep pipe clean during laying operations by means of plugs or other methods. When work is not in progress, securely close open ends of pipe and fittings to prevent water, earth, or other substances from entering.

H. Minimum cover over water mains shall be 18 inches in planting areas and 36 inches under pavement. Control valves shall never be less than 3 inches below finished grade. Cover laterals to minimum depth of 12 inches.

I. Existing sidewalks and curbs shall not be cut during trenching and installation of pipe. Install pipe under sidewalks and curbs by jacking, auger boring, or by tunneling. Repair or replace any concrete that cracks, due to settling, during the warranty period.

J. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water and chemical or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
K. Warning tape shall be located above irrigation system water mains and laterals and continuously 12 inches below finish grade.

3.02 LAYING PLASTIC AND PVC PIPE

A. Shall be snaked in trench at least 1 foot per 100 feet to allow for thermal construction and expansion and to reduce strain on connections.

B. Joints


2. Threaded Type: Apply liquid teflon thread lubricant of teflon thread type. After joint is made hand tight (hard), a strap wrench should be used to make up to two additional full turns.

   a. Immediately before joining two lengths of PVC pipe, the inside of the bell or coupling, the outside of the spigot and the elastomeric gasket shall be thoroughly cleaned to remove all foreign material.
   b. Lubrication of the joint and rubber gasket shall be done in accordance with the pipe manufacturer's specifications.
   c. Care shall be taken that only the correct elastomeric gasket, compatible with the annular groove of the bell, is used. Insertion of the elastomeric gasket in the annular groove of the bell or coupling shall be in accordance with the manufacturer's recommendations. Pipe that is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.
   d. The spigot and bell or coupling shall be aligned and pushed until the reference line on the spigot is flush with the end of the bell or coupling. Pushing shall be done in a smooth, steady motion.

3.03 INSTALLATION OF CONTROLLER AND RECEIVER

A. Install Independent Controller which operates irrigation in freestanding pedestal cabinet as shown on plan.
   1. Confirm location with Owner’s Representative prior to installation.

B. Install Weather Sensor Receiver, per manufacturer’s instructions, as shown on plan.

3.04 INSTALLATION OF CONTROL WIRING

A. Interior wiring shall be installed in concealed conduit hidden from view by building finishes. See electrical or communications plans for conduit routing. Courtyard wiring shall be located below pedestal pavers.

B. Seal all penetrations where conduit passes through building walls.

C. Exterior wiring from controllers to valves shall be located in trench with new mains or in
separate trench at back of curb of along pavement, unless cross-country route is shown. Locate in trench with mains when possible on cross-country routes.

1. Verify location of existing utilities and irrigation prior to trenching.

D. Wiring bundles located with piping shall be set with top of the bundle below top of the pipe. No two wires in any bundle shall be of the same color. Wires shall be bundled and tied or taped at 15-foot intervals. A numbered tag shall be provided at each end of a wire, i.e., at valve, at field located controllers and at master controller. The number at each end of wire to be the same.

E. Splicing shall be held to a minimum. A pull box shall be provided at each splice. No splices will be allowed between field located controllers and remote-control valves.

F. Provide 12-inch expansion loops in wiring at each wire connection or change in wire direction. Provide 24-inch loop at remote control valves.

G. Power wiring for the operation of irrigation system shall not be run in same conduit as control wiring.

3.05 TRACER WIRE INSTALLATION

A. Tracer wire shall be installed on bottom of trench, adjacent to vertical pipe projections, carefully installed to avoid stress from backfilling, and shall be continuous throughout length of pipe with spliced joints soldered and covered with insulation type tape.

B. Tracer wire shall follow main line pipe and branch lines and terminate in yard box with gate valve controlling these main irrigation lines. Provide sufficient length of wire to reach finish grade, bend back end of wire to make a loop and attach a Dymo-Tape type plastic label with designation "Tracer Wire."

C. Record locations of tracer wires and their terminations on project record documents.

3.06 SETTING OF VALVES

A. No valves shall be set under roads, pavement or walks.

B. Clean interior of valves of foreign matter before installation.

C. Where pressure control valves are installed adjacent to remote control valve, they shall be housed in the same valve box.

D. Set valve box cover flush with finished grade.

3.07 SLEEVING

A. Furnish and install where pipe and control wires pass under walks, paving, walls, and other similar areas.

B. Sleevling under pavement to be twice line size or greater to accommodate retrieval for repair of wiring or piping and shall extend 12 inches beyond edges of paving or construction.
1. Bed sleeves with a minimum of 4 inches of sand backfill above top of pipe.

C. Sleeving through walls to be minimum size required to accommodate pipe and wiring.

3.08 TEST AND FLUSHING

A. See Specification 32 84 13 – Drip Irrigation

1. Section 1.04 Flushing and Testing

END OF SECTION
SECTION 32 84 13 - DRIP IRRIGATION

PART 1 - GENERAL

1.01 SCOPE SUMMARY

A. This section specification information is for Rain Bird low volume dripline irrigation products including Control Zone Kits, XFCV Dripline, compatible fittings, and Low Volume Emission Devices.

B. Provide labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the drip irrigation system, and guarantee/warranty as shown on the drawings, the installation details, and as specified herein.

1.02 RELATED WORK

A. Division 00 – Procurement and Contracting Requirements

B. Division 01 – General Requirements

C. Division 22 – Plumbing

D. Division 26 – Electrical

E. Division 31 – Earthwork

F. Division 32 – Exterior Improvements

1. Section 32 84 00 – Planting Irrigation

G. Division 33 - Utilities

1.03 SUBMITTALS

A. Deliver four (4) copies of submittals to Owner’s Representative within ten (10) working days from date of Notice to Proceed. Furnish information in 3-ring binder with table of contents and index sheet. Index sections for different components and label with specification section number and name of component. Furnish submittals for components on material list. Indicate which items are being supplied on catalog cut sheets when multiple items are shown on one sheet. Owner’s Representative. Incomplete submittals will be returned without review.

B. Materials List: Include dripline and low-volume irrigation components, control zone components, shop drawings and other components shown on drawings and installation details or described herein. Quantities of materials need not be included.
C. Manufacturers' Data: Submit manufacturers' catalog cuts, specifications, and operating instructions for equipment shown on materials list.

D. Shop Drawings: Submit shop drawings called for in installation details. Show products required for proper installation, their relative locations, and critical dimensions. Note modifications to installation details as part of shop drawing documentation.

1.04 FLUSHING AND TESTING

A. Schedule testing with Owner’s Representative a minimum of three (3) days in advance of testing.

B. Provide clean, clear water, pumps, labor, fittings, and equipment necessary to conduct line flushing and testing procedures.

C. Recommended Dripline and Emitter Lateral Flushing Procedures.

1. Flush the system every two weeks for the first six (6) weeks and check the water that is flushed out for cleanliness. Establish a regular system flushing schedule for the future based on results from the initial six-week flushing schedule.

2. Flush the system completely after any repairs are made and monitor system operation closely under regular system flushing schedule.

3. Check the pressure at the supply and flush headers on a regular basis and compare with the pressure readings taken after installation.

D. Recommended Dripline and Emitter Lateral Leakage Testing Procedures.

1. Subject installed dripline tubing and emitter lateral piping to water pressure equal to specified operating pressure for ten (10) minutes. Test with control zone components and dripline flush valve components installed.

2. Partially backfill buried pipe and tubing to prevent movement under pressure. Expose couplings, fittings, and valve components.

3. Visually inspect valve assemblies and fittings for leakage and replace defective pipe, fitting, joint, valve, or appurtenance. Repeat test until test segment is free from leaks. Cement or caulking to seal leaks is prohibited.

E. Recommended Dripline and Emitter Lateral Operational Testing Procedures.

1. Activate each dripline and emitter lateral control zone valve in sequence from controller. Provide either one additional person with radio or use handheld remote to activate remote control valves from controller. Manually activating remote control valve using manual bleed mechanism at remote control valve is not an acceptable method of activation. Owner’s Representative will visually observe operation, water application patterns, and leakage.
2. Replace or adjust defective valve, fitting, dripline segment, emitter lateral segment, or appurtenance to correct operational and coverage uniformity deficiencies.

3. Repeat test(s) until each dripline or emitter lateral test segment passes testing procedures. Repeat tests, replace components, and correct deficiencies at no additional cost to Owner and/or Owner’s Representative.

1.05 CONSTRUCTION REVIEW

A. The purpose of on-site reviews by Owner’s Representative is to periodically observe work in progress, Contractor’s interpretation of construction documents, and to address questions with regard to installation.

B. Schedule reviews for dripline layout and system testing with Owner’s Representative as indicated on drawings or as required by these specifications.

C. Impromptu reviews may occur at any time during project.

D. A review will occur at completion of irrigation system installation and Project Record Drawing submittal.

1.06 GUARANTEE/WARRANTY AND REPLACEMENT

A. The purpose of guarantee/warranty is to ensure that Owner receives irrigation materials of prime quality, installed and maintained in thorough and careful manner.

B. Contractor is responsible for providing guarantee/warranty of irrigation materials, equipment, and workmanship against defects for period of one (1) year from formal written acceptance by Owner’s Representative. Fill and repair depressions. Restore landscape, utilities, structures and site features damaged by settlement of irrigation trenches or excavations. Repair damage to premises caused by defective items. Make repairs within seven (7) days of notification from Owner’s Representative.

C. Replace damaged items with new and identical materials, using methods specified in contract documents or applicable codes. Make replacements at no additional cost to contract price.

D. Guarantee/warranty applies to originally installed materials and equipment, and replacements made during guarantee/warranty period.

PART 2 – MATERIALS

2.01 QUALITY

A. Provide and install specified equipment and materials, delivered new to the site in unopened containers and confirmed to be without flaws or defects.
2.02 LATERAL PIPE AND FITTINGS

A. Use rigid, un-plasticized polyvinyl chloride (PVC) 1120, 1220 National Sanitation Foundation (NSF) approved pipe, extruded from material meeting requirements of Cell Classification 12454-A or 12454-B, ASTM Standard D1784, with integral belled end suitable for solvent welding.

B. Use Class 200, SDR-21, rated at 200 PSI (13.8 bar), conforming to dimensions and tolerances established by ASTM Standard D2241. Use PVC pipe rated at higher pressures than Class 200 in the cases where small nominal diameters are not manufactured in Class 200.

C. Use Schedule 40, Type 1, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784 for PVC pipe. Use primer approved by pipe manufacturer. Solvent cement to conform to ASTM Standard D2564, of type approved by pipe manufacturer.

D. Use PVC Schedule 80 nipples and PVC Schedule 40 or 80 threaded fittings for threaded pipe connections as specified on the drawings and details.

E. Threaded joint sealant: Use non-hardening, nontoxic pipe thread sealant formulated for use on threaded connections and approved by pipe fitting or valve manufacturer.

2.03 DRIP IRRIGATION COMPONENTS

A. Rain Bird Control Zone Kits

1. General Information
   a. Provide control zone kits manufactured by Rain Bird as indicated on construction drawings.
   b. Control zone kit assemblies for dripline irrigation zones must include control valve, filtration, and pressure regulation components sized to meet the hydraulic demands and flow requirements of the zones that they service.

2. Rain Bird Low Flow Control Zone Kit for dripline zones with flows from 0.2 to 5.0 GPM (0.8 to 18.9 lpm), including low flow valve (LFV) and pressure regulating filter (PRF).
   a. Available model numbers:

   1) XCZF-LF-100 [1” (25 mm) Low Flow valve 1” with flow control handle and 3/4” (19 mm) PR filter]

   b. Low Flow Valve (LFV) component specifications include:

   1) Valve body and bonnet constructed of high impact, weather-resistant plastic, stainless steel and other chemical/UV resistant materials
   2) Diaphragm with a double-knife seal, constructed of durable Buna-N rubber with a clog-resistant metering orifice
   3) Energy-efficient, low-power encapsulated solenoid with captured plunger and 90 mesh (200 micron) solenoid filter
   4) External bleed for manual system flushing during start-up, internal bleed for manual zone activation during maintenance operations
5) Inlet pressure rating: 20 to 120 PSI (1.4 to 8.3 bar)
6) Female threaded inlet and outlet connections
7) Anti-siphon valve configuration (AXCZ-075-PRF) includes listed features and incorporates atmospheric vacuum breaker with I.A.P.M.O and A.S.S.E. listing approval

c. Pressure Regulating Filter (PRF) combines filtration and pressure regulation in one integrated unit for protection of downstream components of drip irrigation system. PRF component specifications include:

1) Compact “Y” filter body and cap configuration constructed of glass-filled, UV-resistant polypropylene, with 120 PSI (8.3 bar) operating pressure rating. Maximum dimensions of filter body; Height: 4 1/2” (11.4 cm), Length: 5 1/2” (14 cm), Width: 2” (5.1 cm)
2) Standard 200 mesh (75 micron) filter screen constructed of durable stainless steel attached to a polypropylene frame. Screen is serviceable for cleaning purposes by unscrewing cap from filter body and removing filter element.
3) Normally-open pressure regulating device with preset outlet pressure of approximately 30 PSI (2.1 bar). Pressure regulating device allows full flow with minimal pressure loss unless inlet pressure is greater than preset level. As inlet pressure increases above preset level, internal spring compresses to reduce downstream pressure.
4) Male threaded 3/4” (19 mm) inlet and outlet connections.

3. Rain Bird Medium Flow Control Zone Kit for dripline zones with flows from 3.0 to 15.0 GPM (11.4 to 56.8 lpm), including Rain Bird DV or ASVF valve and pressure regulating filter (PRF).

a. Available model numbers:

1) XCZF-100-PRF [1” (25 mm) DV valve with removable flow control handle and 1” (25 mm) PR filter]

b. DV Valve component specifications must include:

1) Valve body and bonnet constructed of high impact, weather-resistant plastic, stainless steel and other chemical/UV resistant materials
2) Energy-efficient, low-power encapsulated solenoid with captured plunger and 90 mesh (200 micron) solenoid filter
3) External bleed for manual system flushing during start-up, internal bleed for manual zone activation during maintenance operations
4) Inlet pressure rating: 20 to 120 PSI (1.4 to 8.3 bar)
5) Female threaded inlet and outlet connections
6) Anti-siphon valve configuration (XACZ-100-PRF) includes listed features and incorporates atmospheric vacuum breaker with I.A.P.M.O and A.S.S.E. listing approval

c. Pressure Regulating Filter (PRF) combines filtration and pressure regulation in one integrated unit for protection of downstream components of drip irrigation system. PRF component specifications include:
1) Compact “Y” filter body and cap configuration constructed of glass-filled, UV-resistant polypropylene, with 120 PSI (8.3 bar) operating pressure rating. Maximum dimensions of filter body; Height: 4 1/2" (11.4 cm), Length: 5 1/2" (14 cm), Width: 2" (5.1 cm)

2) Standard 200 mesh (75 micron) filter screen constructed of durable stainless steel attached to a polypropylene frame. Screen is serviceable for cleaning purposes by unscrewing cap from filter body and removing filter element.

3) Normally-open pressure regulating device with preset outlet pressure of approximately 40 PSI (2.8 bar). Pressure regulating device allows full flow with minimal pressure loss unless inlet pressure is greater than preset level. As inlet pressure increases above preset level, internal spring compresses to reduce downstream pressure.

4) Male threaded 1” (25 mm) inlet and outlet connections.

4. Rain Bird XFCV Dripline with Heavy-Duty Check Valve and pressure-compensating inline emitters.
   a. Available Rain Bird XFCV Dripline with Heavy Duty-Check Valve model numbers for POTABLE water systems; brown colored dripline tubing with emitter flow rates and spacing as shown:
      1) Rain Bird XFCV-06-18; 0.6 GPH (2.3 lph) emitters spaced 18” (45.7 cm) on-center
      2) Rain Bird XFCV-09-18; 0.9 GPH (3.4 lph) emitters spaced 18” (45.7 cm) on-center
   b. Required dripline tubing material and performance specifications include:
      1) XFCV tubing; dual-layered, brown in color, conforming to an outside diameter (O.D.) of 0.634 inches (16 mm) and an inside diameter (I.D.) of 0.536 inches (13.6 mm) and wall thickness of 0.049 inches (1.2 mm)
      2) Inline emitter that includes a 3.5psi check-valve to facilitate 8ft of holdback
      3) Factory installed, pressure-compensating, inline emitters welded to the inner circumference of the polyethylene tubing at spacing specified by model number
      4) Inline emitters designed to pressure-compensate by lengthening the emitter’s turbulent flow path (Rain Bird patent pending)
      5) Consistent flow rate from each installed inline emitter when emitter inlet pressure is supplied between recommended operating range of 8.5 to 60 PSI (0.7 to 4.1 bar)
      6) Required filtration for XF Series dripline tubing and emitters is 120 mesh (125 micron)

5. Rain Bird XF Series Blank Dripline Tubing
   a. Available model numbers for POTABLE water systems:
      1) Rain Bird XFD blank tubing, dual-layered and brown in color.

6. Rain Bird Easy Fit Dripline Tubing Compression Fittings
   a. Available model numbers, designed for compatibility with Rain Bird XF Series Dripline Tubing:
1) Tee: MDCFTEE
2) Coupling: MDCFCOUP
3) Elbow: MDCFEL
4) Adapters:
   a) 1/2” (13 mm) Male pipe thread adapter: MDCF50MPT
   b) 3/4” (19 mm) Male pipe thread adapter: MDCF75MPT
   c) 1/2” (13 mm) Female pipe thread adapter: MDCF50FPT
   d) 3/4” (19 mm) Female pipe thread adapter: MDCF75FPT
   e) 3/4” (19 mm) Female hose thread adapter: MDCF75FHT
5) Flush Cap end closure for POTABLE system: MDCFCAP
6) Flush Cap end closure for NON-POTABLE system: MDCFPCAP

b. Easy Fit compression fitting material and performance specifications include:
   1) Easy Fit directional fittings and flush cap fittings constructed from molded UV-resistant ABS material with Buna-N rubber seal for long-term, leak free connections
   2) Easy Fit adapters constructed from UV-resistant ABS materials for use exclusively with Easy Fit Compression Fittings
   3) Easy Fit Compression Fittings are intended for use with polyethylene tubing from .630” to 669” (16 mm-17 mm) OD to provide a leak-free compression fit
   4) Maximum pressure loss for the Easy Fit adapters estimated to be 0.1 PSI (0,007 bar) per adapter
   5) Operating pressure range for Easy Fit compression fittings and adapters is 0 to 60 PSI (0 to 4,1 bar)

7. Rain Bird Air Relief Valves.
   a. Available model numbers, designed for compatibility with Rain Bird XF Series Dripline Tubing:
      1) ARV050 Air Relief Valve; includes 1/2” (13 mm) air relief valve.

PART 3 – EXECUTION

3.01 INSPECTIONS AND REVIEWS

A. Pre-construction Site Inspection
   1. Verify construction site conditions and note irregularities affecting work of this section. Report irregularities in writing to Owner’s Representative prior to beginning work. Commencement of work implies acceptance of existing site conditions.

B. Utility Locates ("Call Before You Dig")
   1. Arrange and coordinate Utility Locates with local authorities prior to construction.
2. Repair underground utilities that are damaged during construction. Make repairs at no additional cost to contract price.

3.02 DRIPLINE LAYOUT OF WORK

A. Stake out dripline irrigation system. Items staked include manifold/header pipe and tubing, sleeves, control zone assemblies, flush valves, air relief valves, and check valves.

B. Dripline Irrigation System Layout Review: Dripline irrigation system layout review will occur after staking has been completed. Notify Owner’s Representative one week in advance of review. Modifications will be identified by Owner’s Representative at this review.

3.03 DRIPLINE EXCAVATION, TRENCHING, AND BACKFILL

A. Excavate and install pipes at minimum cover indicated in drawings or specifications. Excavate trenches at appropriate width for connections and fittings.

B. Minimum cover for dripline components (distance from top of pipe to finish grade):

1. Buried PVC manifold and supply header pipe to dripline grid layouts: 12” (30,5 cm) to top of pipe.

2. Buried dripline lateral pipe downstream PVC manifold and supply header pipe: 4” (10 cm) to top of pipe.

3. On-grade dripline lateral pipe downstream PVC manifold and supply header pipe: Secure to finish grade with approved tubing stakes. Install and test prior to installation of landscape fabric and mulch.

C. Backfill only after buried lines have been reviewed, tested, and approved.

D. Excavated material is generally satisfactory for backfill. Use backfill free from rubbish, vegetable matter, frozen materials, and stones larger than 2” (50 mm) in maximum diameter. Remove material not suitable for backfill. Use backfill free of sharp objects next to pipe.

E. Dress backfilled areas to original grade. Incorporate excess backfill into existing site grades. Dispose of excess backfill off site.

F. Contact Owner’s Representative for trench depth adjustments where utilities conflict with irrigation trenching and pipe work.

3.04 ASSEMBLING PIPE AND FITTINGS

A. General:

1. Keep pipe free from dirt and debris. Cut pipe ends square, debur and clean as recommended by pipe manufacturer.
2. Keep ends of assembled pipe capped. Remove caps only when necessary to continue assembly.

B. PVC Pipe and Fittings:

1. Use only strap-type friction wrenches for threaded plastic pipe.

2. PVC Solvent Weld Pipe and Fittings:
   a. Use appropriate primer and solvent cement. Join pipe in manner recommended by pipe and fitting manufacturers and in accordance with accepted industry practices.
   b. Cure for thirty (30) minutes before handling and twenty-four (24) hours before pressurizing or installing with vibratory plow.
   c. Snake pipe from side to side within trench.

3. PVC Threaded Connections:
   a. Use only factory-formed threads. Field-cut threads are not permitted.
   b. Apply thread sealant in manner recommended by component, pipe and sealant manufacturers and in accordance with accepted industry practices.

C. Dripline Tubing and Fittings

1. Use only Rain Bird XF-Series Insert Fittings or Rain Bird Easy Fit Compression Fittings for Rain Bird XF-Series dripline tubing connections or transitions as recommended by the Manufacturer’s representative for the specific site and system conditions.

2. Dripline Insert Fittings:
   a. Install dripline tubing and fittings in manner recommended by manufacturer and in accordance with accepted industry practices.

3. Dripline Compression Fittings:
   a. Install dripline tubing and fittings in manner recommended by manufacturer and in accordance with accepted industry practices.

3.05 INSTALLATION OF DRIPLINE IRRIGATION COMPONENTS

A. Control Zone Kit Assembly:

1. Flush mainline pipe before installing Control Zone Kit assembly.

2. Locate where shown on drawings. Connect control wires to remote control valve wires using specified wire connectors and waterproof sealant. Provide connectors and sealant per manufacturer’s recommendations.
3. Install a maximum of four (4) Low Flow or Medium Flow Control Zone Kits per standard rectangular valve box. Install a maximum of one (1) Medium Flow Commercial Control Zone Kits per standard rectangular valve box. Install a maximum of one High Flow Commercial Control Zone Kits per jumbo rectangular valve box.
   a. Locate valve boxes at least 12” (30,5 cm) from, and align with, nearby walls or edges of paved areas.
   b. Group Control Zone Kit assemblies together where practical. Align grouped valve boxes in uniform patterns. Allow at least 12” (30,5 cm) between valve boxes.
   c. Brand controller letter and station numbers on valve box lid in 2” (50 mm) high letters.

B. Lateral Piping and Dripline Tubing

1. Install lateral piping and dripline tubing at locations and in grid patterns as indicated on drawings and installation details, and in strict accordance with manufacturer recommendations.

2. Thoroughly flush PVC lateral piping, supply headers, and dripline tubing immediately upon installation.

C. Air Relief Valve Kit Assembly: Install at all high points in dripline tubing grid as shown and directed on drawings and installation details.

D. Flush Point Assembly: Install in flush header or at ends of each dripline zone segment as shown and directed on drawings and installation details. Install at least 12-inches from and align with adjacent walls or edges of paved areas.

3.06 PROJECT RECORD (AS-BUILT) DRAWINGS

A. Document field changes from original design and construction documents. Maintain on-site and separate from original construction documents, one complete set of documents labeled “Project Field Documents”. Keep documents current. Do not permanently cover work until accurate “as-built” information is recorded.

B. Record pipe network alterations on a daily basis. Record work that is installed differently than shown on construction documents. Record accurate reference dimensions, measured from at least two permanent reference points, of each control zone kit assembly, each dripline zone boundary, each air relief valve assembly, each flush point assembly, and other dripline irrigation components enclosed within valve box.

C. Obtain from Owner’s Representative one set of reproducible Mylar drawings or CAD files prior to construction completion. Duplicate information contained on “Project Field Documents” maintained on-site using technical drafting pen or AutoCAD. Label each sheet "Record Drawing”.

D. Provide “Record Drawings” to Owner’s Representative. Completion of Record Drawings is required prior to final construction review at completion of irrigation system installation.
3.07 WINTERIZATION AND SPRING START-UP

   A. Winterize irrigation system in fall following completion, or partial completion, of irrigation system construction. Start-up irrigation system in spring following completion, or partial completion, of irrigation system construction. Repair any damage caused in improper winterization at no additional cost to Owner. Coordinate winterization and start-up with landscape maintenance personnel.

3.08 MAINTENANCE

   A. Maintain irrigation system for duration of 30 calendar days from formal written acceptance by Owner’s Representative. Make periodic examinations and adjustments to irrigation system components in order to achieve the most efficient and uniform application of water.

   B. Following completion of Contractor's maintenance period, Owner will be responsible for maintaining system in working order during remainder of guarantee/warranty period, for performing necessary minor maintenance, for protecting against vandalism, and for preventing damage after landscape maintenance operation.

3.09 CLEANUP

   A. Remove from site machinery, tools, excess materials, and rubbish upon completion of work.

END OF SECTION
SECTION 32 91 13 - SOIL PREPARATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work includes the furnishing and installation of soil and/or amendments for lawn areas, and landscape planting areas.

1.2 RELATED WORK

A. Section 31 00 00, EARTHWORK
B. Section 31 13 01, TREE PROTECTION
C. Section 32 84 00, PLANTING IRRIGATION
D. Section 32 84 13, LANDSCAPE DRIP IRRIGATION
E. Section 32 90 00, PLANTING

1.3 QUALITY ASSURANCE

A. Qualifications of Contractor: The Contractor shall be active and experienced in work of the type specified, and upon request by the Owners Representative, be able to show evidence of successful completion of projects of similar scope.

B. Regulatory Requirements: Obtain and pay for all permits and testing related to the work of this section.

C. Pre-Grading Inspection: In conjunction with the soil preparation specified herein, meet with the Owners Representative to present and verify requirements, schedule, and proposed soil preparation methods.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples: Submit 1 lb sample of each of the following in clear, sealed plastic bags labeled with material name, source, supplier name, address, and phone number.
   1. Planting Soil Mix
   2. Compost.
C. Test Reports: Submit report from each test identified in Section 1.5 Testing. Report to include date of test, and name, address and phone number of testing laboratory.

D. Delivery Receipts: At the time of Construction, furnish copies of material verifications such as load tickets, invoices, or sales slips.

1.5 TESTING

A. Soil analysis shall be current (within 30 days of submittal), shall be performed by a local Puget Sound area certified laboratory, and shall be done for the final soil mix and not the individual components.

B. Soil analysis shall include USDA soil classification and composition, soil fertility, percentage of organic content as determined by USDA Loss on Ignition Test, pH and soluble salts, cation-exchange capacity, micronutrient analysis, recommendations for amendments for the specified types of plantings and other requirements listed in this specification.

1. Obtain tests and submit reports for the following:

2. Soil Source Tests: Provide one test of each soil mix. If more than one source will be used for a soil type, submit one test from each source. If test shows soil is not in compliance with specifications, amend the soil as recommended by laboratory, re-test and submit report.

   a. Planting Soil Mix

3. Construction Site Soil Tests: To verify compliance with Soil Source Tests, provide testing and submit report for each of the following soil types, in the quantities indicated, using samples from construction site locations determined by the Owners Representative.

   a. Planting Soil Mix: 3 Tests

1.6 PROJECT CONDITIONS

A. Planting Soil Mixes shall meet specifications prior to delivery to job site and shall not require substantial chemical alteration after delivery.

B. Keep streets, sidewalks and site clean, free from debris and affected drains open and free flowing at all times. Protect drains with filter fabric covers during construction. Appropriate erosion control measures shall be employed.

1.7 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.

B. American Society for Testing and Materials (ASTM)
C. D 442-63 Standard Test Method for Particle Size Analysis of Soils

D. D1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort


F. Washington Department of Ecology (WDOE)


H. Interim Guidelines for Compost Quality, Publication #94-38

I. Washington Administrative Code (WAC)

1. Chapter 173-350 Composting Facilities, Definitions and Section 220.

PART 2 - PRODUCTS

2.1 ORGANIC AMENDMENT (COMPOST)

A. The Organic Amendment component shall consist of composted yard debris or organic waste material and shall consist of 100% recycled materials. In addition, the organic material shall have the following physical characteristics:

1. Composted material must be in compliance with DOE Interim Guidelines for Compost Quality, Grade A / WAC Chapter 173-350 Section 220.

2. Shall have carbon to nitrogen ratio of between 20:1 and 40:1. If C/N ratio is greater than 40:1, a lab recommended rate of Nitroform (38-0-0) shall be followed at the time of soil preparation.

3. Shall be certified by the Process to Further Reduce Pathogens (PFRP) guideline for hot composting as established by the United States Environmental Protection Agency.

4. Shall be fully mature and stable before usage.

5. Shall be screened using a sieve no finer than ¼ inch and no greater than ½ inch.

B. Based on dry weight of total organic amendment sample: Must comply with the following percent by weight passing:

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<thead>
<tr>
<th>Sieve Size</th>
<th>Percent (%) Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2” (12.7mm)</td>
<td>100</td>
</tr>
<tr>
<td>1/4” (6.35mm)</td>
<td>95-100</td>
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<tr>
<td>4.76mm</td>
<td>90-95</td>
</tr>
<tr>
<td>2.38mm</td>
<td>75-90</td>
</tr>
<tr>
<td>1.00mm</td>
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C. Shall have heavy metal concentrations below the WSDA per year load limits as follows:

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<thead>
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<th>Metal</th>
<th>WA State – Max. lb/ac./yr.</th>
</tr>
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<tbody>
<tr>
<td>ARSENIC</td>
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<td>ZINC</td>
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</table>

2.2 SOIL (SANDY LOAM OR LOAMY SAND)

A. Sandy Loam or Loamy Sand Soil shall consist largely of sand, but with enough silt and clay present to give it a small amount of stability. Soil classification shall be determined by USDA Soil Texture Classification standards.

B. Sieve sizing shall meet the following:

<table>
<thead>
<tr>
<th>Screen Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ inch</td>
<td>100%</td>
</tr>
<tr>
<td>¼ inch</td>
<td>95-100%</td>
</tr>
<tr>
<td>#10</td>
<td>85-95%</td>
</tr>
<tr>
<td>#30</td>
<td>60-75%</td>
</tr>
<tr>
<td>#60</td>
<td>50-60%</td>
</tr>
<tr>
<td>#100</td>
<td>20-30%</td>
</tr>
<tr>
<td>#200</td>
<td>5-15%</td>
</tr>
<tr>
<td>Clay particle</td>
<td>5% maximum</td>
</tr>
</tbody>
</table>

2.3 COARSE SAND

A. Coarse Sand shall be naturally occurring mineral sand, free of deleterious materials, meeting the following size gradation:

<table>
<thead>
<tr>
<th>Screen Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>¼ inch</td>
<td>95-100%</td>
</tr>
<tr>
<td>#10</td>
<td>85-95%</td>
</tr>
<tr>
<td>#30</td>
<td>60-75%</td>
</tr>
<tr>
<td>#60</td>
<td>50-60%</td>
</tr>
<tr>
<td>#100</td>
<td>20-30%</td>
</tr>
<tr>
<td>#200</td>
<td>Less than 5%</td>
</tr>
<tr>
<td>Clay particle</td>
<td>0%</td>
</tr>
</tbody>
</table>

2.4 PLANTING SOIL MIX

A. The Planting Soil mix shall consist of 67% sandy/loam mix and 33% organic amendment by volume (refer to DPR Standard Specifications, Section 02924 - Organic Amendment for...
specific information about this component) and shall meet or exceed the following specifications:

<table>
<thead>
<tr>
<th>Screen Size</th>
<th>Percent Retained</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.35mm</td>
<td>5%</td>
<td>95%</td>
</tr>
<tr>
<td>#10</td>
<td>15</td>
<td>85</td>
</tr>
<tr>
<td>#30</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>#60</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>#100</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>#200</td>
<td>90</td>
<td>10</td>
</tr>
</tbody>
</table>

1. The Soil component shall be sandy loam, based on USDA standards.

<table>
<thead>
<tr>
<th>Class</th>
<th>Particle Size Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse sand</td>
<td>0.5 - 2.0 mm</td>
</tr>
<tr>
<td>All sands</td>
<td>0.05 - 2.0 mm</td>
</tr>
<tr>
<td>Silt</td>
<td>0.002 - 0.05 mm</td>
</tr>
<tr>
<td>Clay</td>
<td>&lt;0.002 mm</td>
</tr>
</tbody>
</table>

2. Planting soil shall have a pH range of from 5.5 to 7.5.

3. Shall have heavy metal concentrations below the WSDA per year load limits as follows:

<table>
<thead>
<tr>
<th>Metal</th>
<th>WA State - Maximum lb./ac./yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARSENIC</td>
<td>0.297</td>
</tr>
<tr>
<td>CADMIUM</td>
<td>0.079</td>
</tr>
<tr>
<td>COBALT</td>
<td>0.594</td>
</tr>
<tr>
<td>LEAD</td>
<td>1.981</td>
</tr>
<tr>
<td>MERCURY</td>
<td>0.019</td>
</tr>
<tr>
<td>MOLYBDENUM</td>
<td>0.079</td>
</tr>
<tr>
<td>NICKEL</td>
<td>0.713</td>
</tr>
<tr>
<td>SELENIUM</td>
<td>0.055</td>
</tr>
<tr>
<td>ZINC</td>
<td>7.329</td>
</tr>
</tbody>
</table>

4. Sodium Adsorption Ratio shall be less than 6.0.

5. Saturation extract concentration of Boron shall be less than 1.0ppm.

6. Soil Structure shall be loose, friable, and not subject to consolidation or compaction.

7. The water percolation/infiltration rate of the disturbed soil sample shall be a minimum of 0.4 inches per hour.

8. Soil should contain less than 100 plant parasitic nematodes per 100 cc soil

9. Minimal weed seed should be present, based on germination testing of a representative sample.

10. Soil is to be relatively free of soil-borne plant pathogens.
11. Shall have a Saturation Extract Conductivity of less than 4.0 dS/m @ 25 degrees C. as determined in a saturation extract. Use the following table to determine the maximum allowable ECe (dS/m of saturation extract) of compost at the desired use rate.

<table>
<thead>
<tr>
<th>Desired Use Rate</th>
<th>Salinity (ECe) of On-Site Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 dS/m</td>
</tr>
<tr>
<td>Cu. Yds. Amendment per 1000 sq. ft. for incorporation to 6” soil depth</td>
<td>Volume Percentage of Amendment</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>27</td>
</tr>
<tr>
<td>6</td>
<td>32</td>
</tr>
</tbody>
</table>

**PART 1 - MAXIMUM ECE OF COMPOST**

12. Non-soil components should be less than 1% by volume. (i.e. plastic, sticks, glass, etc.)

13. Soil mix shall contain sufficient quantities of available nitrogen, potassium, phosphorus, calcium, magnesium, sulfate, copper, zinc, manganese, iron and boron to support normal plant growth. In the event of nutrient inadequacies, provisions shall be made to add required materials prior to planting.

14. Submit soil analysis from a soils testing laboratory to the Engineer. Indicate source and obtain the Engineer's approval before hauling to site (analysis test with a 2 pound bag sample is required).

15. Acceptable Sources:
   
   a. Astec, LLC, Bellevue, WA
   b. Cedar Grove Compost Company, Maple Valley, WA
   c. Northwest Cascade, Puyallup, WA
   d. Pacific Topsoils, Inc., Everett, WA

16. Other approved equal.
(For other available sources refer to the current edition of "Directory of Recycled Content Building and Construction Products" as published by the Clean Washington Center, Department of Trade and Economic Development, 2001 Sixth Avenue, Suite 2700,
PART 3 - EXECUTION

3.1 PREPARATION OF SUB-GRADE

A. For new planting areas outside of critical root zones (CRZ) of existing trees to be saved: Rip, disc, or scarify sub-grade soils to a minimum depth of 6 inches. Compact to 85% density. Sub-grade elevations to allow for installation of specified depth of planting soil and mulch.

B. For areas within CRZ of existing trees that are to receive new plantings: Lightly scarify surface.

3.2 SOIL PREPARATION IN PLANTED AREAS

A. Before soil installation, contractor shall ensure area to be covered is free from debris including deleterious materials.

B. Soil placement and consolidation shall not occur when the soil is excessively wet. Mixing or placing planting soil mix shall not be allowed if the area receiving soil is frozen, excessively wet or saturated or has been subjected to more than ½-inch of precipitation within 48-hours prior to mixing or placement. The OWNERS REPRESENTATIVE will have final authority to determine if wet or saturated conditions exist.

C. New Landscape Planting Areas outside of CRZ of existing trees to be saved: Place 6 inches of Planting Soil Mix and thoroughly rototill soil into top 18 inches of prepared sub-grade. Place additional 6 inches of Planting Soil Mix and amendments, measured after compaction.

D. Areas within CRZ of existing trees that are to receive new plantings: Place 2 inches of Planting Soil Mix.

3.3 FINE GRADING

A. Perform fine grading to attain finish grades as shown on the Plans.

B. Rake out all rocks, roots, sticks and other debris larger than 1-inch diameter or sticks longer than 3 inches long. Leave surface even and readily able to accommodate lawn or planting installation.

C. Compact to 80-85 percent density.

3.4 INSPECTION

A. The Contractor shall notify the OWNERS REPRESENTATIVE and LANDSCAPE ARCHITECT at least 48 hours in advance of the time of inspection required for completion of soil preparation, and before planting of trees, shrubs and groundcover can occur.
PART 1 - GENERAL

1.1 DESCRIPTION
   A. This work consists of furnishing and installing all planting materials required for landscaping hereinafter specified in locations as shown.

1.2 EQUIPMENT
   B. Maintain all equipment, tools and machinery while on the project in sufficient quantities and capacity for proper execution of the work.

1.3 RELATED WORK
   A. Related Work Specified Elsewhere: Coordinate related work specified in other parts of the Project Specifications, including but not limited to the following:
      1. Section 01 45 29, TESTING LABORATORY SERVICES, Topsoil Testing
      2. Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS
      3. Section 31 20 00, EARTH MOVING, Topsoil Materials
      4. Section 32 01 90, OPERATION AND MAINTENANCE OF PLANTING
      5. Section 32 84 00, LANDSCAPE IRRIGATION
      6. Section 32 84 13, DRIP IRRIGATION
      7. Section 32 91 13, SOIL PREPARATION

1.4 SUBMITTALS
   A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
   
   B. Samples: Submit the following samples in sealed plastic bags labeled with supplier’s name, address and phone number for approval prior to delivery to the project site:
      1. Dark Fine Woodchip Mulch: 5 pounds of each type to be used.
C. Certificates of Conformance or Compliance: Before delivery, notarized certificates attesting that the following materials meet the requirements specified shall be submitted to the Owner’s representative for approval:

1. Plant Materials (Department of Agriculture certification by State Nursery Inspector declaring material to be free from insects and disease).
2. Fertilizers
3. Lime
4. Peat

D. Plant Material Documentation:

1. Sixty (60) days prior to beginning work in this section submit documentation that specified plant materials have been secured
2. List of supplier’s names, addresses, and phone numbers.
3. Substitutions are not allowed without approval. Provide verification from 3 sources that specified plants are not available.
4. When requested by the Owner’s representative, submit product sale receipts for nursery stock and certificates of inspection from required authorities.

E. Manufacturer's Literature and Data:

1. Fertilizer
2. Mycorrhizal Inoculant
3. Antidesiccant
4. Tree Ties
5. Coir Log

F. Licenses: Licenses of Arborist shall be submitted (one copy), to the Owner’s representative.

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below, form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

B. American National Standards Institute (ANSI) Publications:

1. ANSI Z60.1-04 Nursery Stock
2. ANSI Z133.1-06 Tree Care Operations – Pruning, Trimming, Repairing, Maintaining, and Removing Trees and Cutting Brush – Safety Requirements

C. Hortus Third, A Concise Dictionary of Plants Cultivated in the U.S. and Canada.
D. American Society for Testing and Materials (ASTM)
   1. C136-06 Sieve Analysis of Fine and Coarse Aggregates

E. U. S. Department of Agriculture

1.6 DELIVERY AND STORAGE

A. Delivery:
   1. Notify the Owner’s representative of the delivery schedule in advance so the plant material may be inspected upon arrival at the job site. Remove unacceptable plant material from the job site immediately.
   2. Protect plants during delivery to prevent damage to root balls or desiccation of leaves. Protect trees during transport by tying in the branches and covering all exposed branches.
   3. The use of equipment such as "tree spades" is permitted provided the plant balls are sized in accordance with ANSI Z60.1 and tops are protected from damage.
   4. Deliver fertilizer and lime to the site in the original, unopened containers bearing the manufacturer's warranted chemical analysis, name, trade name or trademark, and in conformance to state and federal law. In lieu of containers, fertilizer and lime may be furnished in bulk and a certificate indicating the above information shall accompany each delivery.

B. Storage:
   1. Keep lime, and fertilizer in dry storage away from contaminants.
   2. Store plants not installed on the day of arrival at the site as follows:
      a. Shade and protect plants from the wind when stored outside.
      b. Protect plants stored on the project from drying out at all times by covering the balls or roots with moist sawdust, wood chips, shredded bark, peat moss, or other similar mulching material.
      c. Keep plants, including those in containers, in a moist condition until planted, by watering with fine mist spray.

1.7 PLANT INSTALLATION

A. Orient plant material to give best appearance in relation to structure, roads and walks.

B. Remove container and place root ball into planting hole. The crown of the root ball should typically be at the same height as it was in the container. Ensure roots are loose and not root bound from nursery containers. If circular roots are present, loosen root ball and spread root mass in planting hole.
C. Grade planting bed to maintain positive drainage and prepare site for irrigation installation.

D. Water plant material thoroughly. After soil settlement has occurred, fill with soil to finish grade.

1.8 PLANT INSTALLATION SEASONS AND CONDITIONS

A. No work shall be done when the ground is frozen, snow covered, saturated with water or in an otherwise unsuitable condition for planting. Submit a written request to the Owner’s representative stating the special conditions and proposal variance.

B. Do not install plant material when ambient temperatures may drop below 35°F or above 80°F.

C. Do not install plants when wind velocity exceeds 30 MPH.

D. Planting of trees, shrubs, and groundcover shall be performed during the period between October 1 and April 30.

E. When installing plant material during the warm season and when extended warm/hot weather is forecasted, install plants only when water is available on site and arrangements are made to provide regular watering.

F. Special conditions may exist that warrant a variance in the specified planting dates or conditions. Planting at other times shall only be done with written permission from the Owner’s representative and only if an automatic irrigation system is available at the site at the time of planting.

1.9 PLANT MAINTENANCE PERIOD

A. Pruning and Training:

1. No pruning of any plant material shall commence without prior approval of Consultant. Refer also to Section 32 93 43 – Pruning. Prune trees and shrubs according to accepted horticulture practices as outlined in the ANSI A300 standards.

2. Plants have been chosen for their form and size and in general, should not need pruning.

3. When pruning is necessary and has been approved: Prune only with sharp tools. No flush cutting or branch stubs to be left.

4. Pruning should occur at minimum once during the Warranty Period with two additional annual applications per year during the 24-month establishment maintenance period. Different plants have specific growth habits and pruning schedules should be adjusted as needed. If plant material is aggressive, additional pruning schedules may be required.

B. The Plant Maintenance Period for all newly created plant beds, transplanted trees, and installed trees, shrubs, perennials, grasses, and groundcovers shall begin immediately after installation, with the approval of the Owner’s representative, and continue until one year after the date of Substantial Completion.
C. Plant Maintenance Operations shall be per Specification 32 01 90 Operation and Maintenance of Planting.

1.10 PLANT WARRANTY

A. All work shall be in accordance with the terms of the Paragraph, "Warranty" of FAR clause 52.246-21, including the following supplements:

1. A **One Year Plant Warranty** will begin on the date that of Substantial Completion. The Contractor shall have completed, located, and installed all plants and turf according to the plans and specifications. All plants are to be living and in a healthy condition at the time of final inspection.

2. The Contractor will replace all dead plant material immediately. A one-year warranty for the plants that were replaced will begin on the day the work is completed.

3. Replacement of relocated plants that the Contractor did not supply is not required unless they die from improper handling and care during transplanting. Loss due to Contractor negligence in transplanting or maintenance requires replacement in kind and size. Determination of whether loss is due to improper transplanting or maintenance will be made by the Owner’s representative.

4. The Owner’s representative will reinspect all plants at the end of the One Year Warranty. The Contractor will replace all dead, missing, or defective plant material immediately. The Warranty will end on the date of this inspection provided the Contractor has complied with the work required by this specification. The Contractor shall also comply with the following requirements:

   a. Replace dead, missing or defective plant material prior to final inspection.
   b. Mulch and weed plant beds and saucers.
   c. Remove stakes, guy wires and tree wrappings from plants that have been in place for one year.

PART 1 - PRODUCTS

2.1 GENERAL

A. All plant material will conform to the varieties specified or shown in the plant list and be true to botanical name as listed in Hortus Third.

2.2 PLANTS

A. Plants shall be in accordance with ANSI Z60.1, except as otherwise stated in the specifications or shown on the plans. Where the drawings or specifications are in conflict with ANSI Z60.1, the drawings and specification shall prevail.
B. Provide well-branched and formed planting stock, sound, vigorous, and free from disease, sunscald, windburn, abrasion, harmful insects or insect eggs with healthy, normal, and unbroken root systems. Provide evergreen shrubs with well-developed symmetrical tops with typical spread of branches for each particular species or variety. Provide ground cover and vine plants with the number and length of runners for the size specified, and the proper age for the grade of plants specified. Provide vines and ground cover plants well established in removable containers, integral containers, or formed homogeneous soil sections. Plants shall have been grown under climatic conditions similar to those in the locality of the project. Spray all plants budding into leaf or having soft growth with an anti-desiccant at the nursery before digging.

C. The minimum acceptable sizes of all plants, measured before pruning with branches in normal position, shall conform to the measurements designated. Plants larger in size than specified may be used with the approval of the Owner’s representative, with no change in the contract price. When larger plants are used, increase the ball of earth or spread of roots in accordance with ANSI Z60.1.

D. Provide nursery grown plant material conforming to the requirements and recommendations of ANSI Z60.1. Dig and prepare plants for shipment in a manner that will not cause damage to branches, shape, and future development after planting.

E. Balled and burlapped (B&B) plant ball sizes and ratios will conform to ANSI Z60.1, consisting of firm, natural balls of soil wrapped firmly with burlap or strong cloth and tied.

F. Container grown plants shall have sufficient root growth to hold the earth intact when removed from containers but shall not be root bound.

G. Make substitutions only when a plant (or its alternates as specified) is not obtainable and the Owner’s representative authorizes a request for substitution, or change order providing for use of the nearest equivalent obtainable size or variety of plant having the same essential characteristics with an equitable adjustment of the contract price.

H. When existing plants are to be relocated, ball sizes shall conform to requirements for collected plants in ANSI Z60.1, and plants shall be dug, handled, and replanted in accordance with applicable sections of these specifications.

2.3 LABELS

A. Each plant, or group and bundles or containers of the same species, variety, and size of plant, shall be legibly tagged with a durable, waterproof and weather-resistant label indicating the correct plant name and size specified in the plant list. Labels shall be securely attached and not be removed.

2.4 LIME

A. Lime shall be agricultural limestone containing not less than 90 percent calcium and magnesium carbonates. Lime must be ground to such a fineness that not less than 90% passes through a No. 8 sieve.
### 2.5 PLANTING SOIL MIXTURE

**A.** See Section 32 91 13, Soil Preparation

### 2.6 PLANT FERTILIZER

**A.** Provide plant fertilizer that is commercial grade and uniform in composition and conforms to applicable state and federal regulations.

**B.** For new and transplanted plant material, provide packet, tablet, or pellet forms of slow release fertilizers, bearing the manufacturer's warranted statement of analysis. Slow release fertilizers shall contain a minimum percentage by weight of 15% nitrogen (of which 100% percent will be organic), 15% available phosphoric acid, and 15% potash, and meet the following specifications unless higher percentages are recommended by the soil test report recommendations:

<table>
<thead>
<tr>
<th>Element</th>
<th>Percentage (w/w)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Nitrogen (N)</td>
<td>15.0%</td>
</tr>
<tr>
<td>(4.6% Ammoniacal Nitrogen)</td>
<td></td>
</tr>
<tr>
<td>(3.2% Urea Nitrogen)</td>
<td></td>
</tr>
<tr>
<td>(3.3% Coated Slow Release Urea Nitrogen)</td>
<td></td>
</tr>
<tr>
<td>(2.3% Slowly Available Water-Soluble Nitrogen)</td>
<td></td>
</tr>
<tr>
<td>(1.6% Water Insoluble Nitrogen)</td>
<td></td>
</tr>
<tr>
<td>Available Phosphoric Acid (P₂O₅)</td>
<td>22.0%</td>
</tr>
<tr>
<td>Soluble Potash (K)</td>
<td>15.0%</td>
</tr>
<tr>
<td>Sulfur (S)</td>
<td>4.0%</td>
</tr>
<tr>
<td>Boron (B)</td>
<td>0.06%</td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>1.0%</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>0.15%</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>0.06%</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>0.14%</td>
</tr>
<tr>
<td>Calcium (Ca)</td>
<td>9.0%</td>
</tr>
</tbody>
</table>

**C.** For existing trees, provide granular fertilizer bearing the manufacturer's warranted statement of analysis.

1. **Planting Fertilizer:** (7-4-9) shall be 100% organic fertilizer meeting the following:

   - Total Nitrogen (N) 7%
     - 0.5% nitrate nitrogen (N)
     - 6.5% water insoluble nitrogen (N)
   - Available Phosphoric Acid (P₂O₅) 4%
   - Soluble Potash (K₂O) 9%
   - Calcium 7%

   Shall be derived from: Fish meal, crab meal fines, kelp meal, fish bone meal, and agricultural gypsum.
2.7 MICORRHIZAL INOCULANT

A. Mycorrhizal Inoculants shall be 100% organic, granular form, containing a minimum of nine (9) species of endomycorrhizal and seven (7) species of ectomycorrhizal fungi.

2.8 COIR LOG

A. Mattress Coir Log
   1. Diameter: 9 in (15 cm)
   2. Length: available in 10’ or 16’ ft lengths.
   3. Density: 7 lbs/ft³
   4. Weight: 3 lbs/ft
   5. Fiber: Mattress coir with bristle coir twine.
   6. Netting 2” x 2” Openings (5 cm x 5 cm)
   7. Strength: 90 lbs (400 N)
   8. Source: GEI Works
      772-646-0597
      info@GEIworks.com
      20824 77th Ave S, Kent, WA 98032

B. Stakes
   1. Material: Pine
   2. Dimensions:
      a. Common: 1 in. x 2 in. x 2 ft.
      b. Actual: .562 in. x 1.375 in. x 23.5 in.

2.9 MULCH

A. Mulch shall be free from deleterious materials and shall be stored to prevent inclusion of foreign material.
   1. Dark Fine Woodchip Mulch: Fine Wood Chip Mulch, aged for a dark color. Recycled from trees, then screened to a small size, Dark Fine Mulch is a dark finish product with minimal nutrient content. Should be used as a top dress similar to Bark. Mulch shall not contain compounds detrimental to plant life. Moisture content of bagged mulch not to exceed 22 percent. Size range of 1/2" to 1-1/4" with a maximum of 20 percent passing 1/2" screen.
a. Source: Pacific Topsoils, Inc., or approved equal.

1) Phone: (800) 884-7645
2) https://pacifictopsoils.com/

2.10 WATER
A. Water shall be potable and not contain elements toxic to plant life.

2.11 ANTIDESICCANT
A. Antidesiccant shall be an organic, plant-based oil emulsion specifically manufactured for agricultural use that will provide a protective film over plant surfaces permeable enough to permit transpiration.

PART 3 - EXECUTION

3.1 LAYOUT
A. Stake plant material locations and bed outlines on project site for approval by the Owner’s representative before any plant pits or beds are dug. The Owner’s representative may approve adjustments to plant material locations to meet field conditions.

3.2 EXCAVATION FOR PLANTING
A. Prior to excavating for plant pits and bed, verify the location of any underground utilities. Damage to utility lines will be repaired at the Contractor's expense. Where lawns have been established prior to planting operation, cover the surrounding turf before excavations are made in a manner that will protect turf areas. Barricade existing trees, shrubbery, and beds that are to be preserved in a manner that will effectively protect them during the project construction.

B. Remove rocks and other underground obstructions to a depth necessary to permit proper planting according to plans and specifications. Where underground utilities, construction, or solid rock ledges are encountered, the Owner's representative may select other locations for plant material.

C. Dig plant pits by any approved method so that they have sloped sides and flat bottoms. When pits are dug with an auger and the sides of the pits become glazed, scarify the glazed surface. Size the plant pits as shown in drawings.

D. Where ground cover and planting beds occur in existing turf areas, remove turf to a depth that will ensure the removal of the entire root system, with additional bed preparation as specified in the next paragraph.
3.3 FERTILIZER AND MYCORRHIZAL INOCULANT APPLICATION

A. Existing Trees: Apply fertilizer to existing trees shown on the drawings at the rate of 36 g/mm (2 pounds per inch) caliper. Apply in 300 mm to 450 mm (12 inch to 18 inch) deep holes 40 to 50 mm (1-1/2 to 2 inches) in diameter, made by an earth auger, distributed evenly at not more than 600 mm (2 feet) on center throughout the outer half of the branch spread zone of each tree. Fertilize to within 100 mm (4 inches) of the surrounding grade. Use topsoil to bring the surface up to the surrounding grade. When using fertilizer in packet, tablet, or wedge form, apply in accordance with manufacturer's recommendations.

B. New Shrubs: Apply fertilizer, lime, and Mycorrhizal Inoculants to the planting soil when backfilling planting pits.

1. Apply fertilizer and lime at rate recommended in soil test report
2. Apply Mycorrhizal Inoculants at the following rates unless otherwise specified by manufacturer:
   a. Shrubs: One (1) tablespoon per gallon of container size

C. New Groundcovers, Grasses, and Perennial Herbaceous Plants: Apply fertilizer, lime, and mycorrhizal amendment to the planting soil and rototill to evenly combine.

1. Apply fertilizer and lime at rate recommended in soil test report
2. Apply Mycorrhizal Inoculants at the following rate unless otherwise specified by manufacturer:
   a. One half (1/2) pound per 1,000 sf.

3.4 SETTING PLANTS

A. Handle balled and burlapped and container-grown plants only by the ball or container. Remove container-grown plants in such a way to prevent damage to plants or root system. Gently loosen any outer roots that have circled the container. Do not disturb the inner roots. Set plants plumb and hold in position until sufficient soil has been firmly placed around the roots or ball. Set plants so that the root crown is 1” higher than the surrounding grade. Backfill balled and burlapped and container-grown plants with planting soil mixture as specified to approximately half the depth of the ball and then tamp and water. For balled and burlapped plants, carefully and completely remove excess burlap and tying materials and fold back. Where plastic wrap or treated burlap is used in lieu of burlap, completely remove these materials before backfilling. Tamp and water remainder of backfill Planting Soil Mixture.

B. Using soil, form earth saucers or water basins for watering around plants. Basins to be 2” high for large shrubs.

3.5 MULCHING PLANTS

A. Install mulch within 48 hours after planting as follow:
1. Fine dark woodchip mulch: Install to 4” depth over all plant beds and exposed soil areas except rain gardens, planters, and green roof areas.

B. Keep mulch out of the crowns of shrubs and groundcovers and off buildings, sidewalks, light standards, and other structures.

C. Taper mulch thickness at edge of plant bed to ½” below adjacent pavement, or flush with adjacent lawn.

3.6 PRUNING

A. Prune new plant material and indicated existing plant material in the following manner: Remove dead, broken and crossing branches. Make cuts with sharp instruments as close as possible to the branch collar. Do not make flush cuts. Do not make "Headback" cuts at right angles to line of growth. Remove trimmings from the site.

3.7 WATERING

A. Apply water to the planted areas immediately following installation at a rate sufficient to ensure thorough wetting of the soil to a depth of at least 100 mm (4 inches). Supervise watering operation to prevent run-off. Supply all pumps, hoses, pipelines, and sprinkling equipment. Repair all areas damaged by water operations.

3.8 RESTORATION AND CLEAN-UP

A. Where existing or new turf areas have been damaged or scarred during planting and construction operations, restore disturbed area to their original condition. Keep at least one paved pedestrian access route and one paved vehicular access route to each building clean at all times. In areas where planting work have been completed, clear the area of all debris, spoil piles, and containers. Clear all other paved areas when work in adjacent areas is completed. Remove all debris, rubbish and excess material from the station.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to following:
   1. Furnishing and installing irrigation water service lines downstream of water meters.
   2. Providing temporary connections to existing systems as needed.
   3. Coordination of work with SPU (Seattle Public Utilities).

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Specifications, including but not limited to following:

   Section 31 20 00 - Earthwork

1.3 REFERENCES

WSDOT-APWA 2018 Standard Specifications for Road, Bridge and Municipal Construction.
All references to measurement and payment therein shall be deleted from consideration.

COLFP City of Lake Forest Park Code and Engineering Development Manual and
Standard Plans

SPU Seattle Public Utilities (Purveyor of Water)


The International Association of Plumbing and Mechanical Officials (IAMPO) Standards.

Underwriters Laboratories Fire Protection Equipment Directory

Factory Mutual Approval Guide

American Water Works Association (AWWA) Standards.

1.4 SUBMITTALS

A. Submit manufacturer's data for products.

1.5 DIMENSIONS AND LAYOUT

A. All layout shall be provided by the Contractor. Layout work shall be performed in accordance with
   COLFP and SPU. Also see Paragraph 31 10 00 - 1.7.

B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are
   displaced or missing.
C. The Contractor is responsible for review of all records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities damaged as a result of the Contractor’s operations at its own expense.

D. The Contractor is to notify the Engineer immediately of underground utilities encountered, which are not shown on the plans.

1.6 CONTRACTOR REQUIREMENTS

A. All Contractors installing, inspecting, servicing or maintain fire protection systems shall be licensed by the State Director of Fire Protection Services in accordance with Chapter 18.106 RCW.

B. Contractor is responsible for coordinating all water system and fire system work with COLFP and the SPU/Owner.

1.7 GENERAL STANDARDS

A. All work and materials shall be in conformance with SPU requirements, except as modified herein.

PART 2 PRODUCTS

2.1 GENERAL MATERIAL STANDARDS

A. Materials for fire sprinkler supply lines shall be UL listed and labeled, Factory Mutual approved, and approved for use in the fire protection system by the local Fire Marshall, codes, and agencies.

B. All materials shall meet the requirements of COLFP and SPU, except as modified herein.

2.2 PIPE AND FITTINGS

A. Domestic service pipe smaller than 4 inches in diameter: Copper Tubing Type K for buried piping. Tubing shall be joined by wrought copper fittings with soldered joints per ASTM B828 for potable water.

2. High density polyethylene (PE) pipe with a standard thermoplastic material designation code of PE4710. Pipe shall meet the requirements of NSF 14/61 and AWWA C901-08. Pipe shall be permanently marked in accordance with all applicable standards per this specification. Marking shall be heat stamped indent print and shall remain legible under normal handling and installation practices. Pipe shall be IPS, SDR11 meeting ASTM D3035. Pipe and fittings shall be joined by thermal fusion per the Manufacturer’s recommended procedures.

2.3 BEDDING AND BACKFILL MATERIAL

A. Bedding material shall be per Section 31 20 00.

B. Backfill material shall be per Section 31 20 00.

PART 3 EXECUTION

3.1 EXAMINATION
3. Prior to beginning any water line construction or ordering materials, Contractor shall excavate and expose existing facilities at proposed points of connection and verify required materials for connection and depth of connection points. Notify Engineer of any discrepancies.

B. Beginning of installation means acceptance of existing conditions.

3.2 TRENCHING

A. Excavation and preparation of the trench shall be in accordance with Section 31 20 00.

B. The trench shall be kept free from water until pipe is laid and backfilled. Surface water shall be diverted so as not to enter trench. Boulders, rocks, and other obstructions shall be removed or cut out to the width of the trench and to a depth of 6 inches below the elevation of bottom of pipe.

C. Dewatering shall be accomplished by using ditches, sumps and pumps depending on the groundwater level at the time of construction.

3.3 WATER SERVICE INSTALLATION

A. Water service lines downstream of meter:
   1. Pipe shall be installed and joined in accordance with manufacturers recommendations. Pipe sections shall be installed and joined in such a manner as not to damage the pipe. Any damage shall be repaired by the Contractor at the Contractor's expense. All touch-up coating for DI pipe accessories shall be made with epoxy coal tar. Inside parts of the pipe accessories shall be touched up with asphaltic varnish, Royston Roykote #612XM, or approved equivalent.
   2. Domestic pipe terminations shall be coordinated with plumbing and fire sprinkler installer. Provide temporary plug and blocking as required.
   3. Polyethylene pipe shall be joined to other materials through the use of electrofusion fittings, flange adapters with back-up rings, or mechanical couplings designed for connecting polyethylene pipe to another material. Installation procedures shall be per the recommendations of the manufacturer of the joining device.
   4. Provide all transition fittings and materials required to connect to existing meter setter or service termination.

3.4 BEDDING AND BACKFILLING

A. Bedding shall be installed in accordance with Section 31 20 00.

B. Backfilling of trenches shall be in accordance Section 31 20 00. Install detectable warning tape for non-metallic pipe for full length of each pipe run. Tape shall be installed eighteen inches above the pipe crown.

3.4 TESTING, FLUSHING AND DISINFECTION

A. All water lines shall be flushed, hydrostatically tested, and disinfected. Final flushing of service pipe shall be in accordance with WSDOT-APWA Section 7-09 and AHJ. Contractor shall provide for proper collection, discharge and disposal of flushing water in accordance with COLFP/Metro requirements.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to following:
   1. Furnishing and installing sanitary sewer piping, cleanouts, manholes and fittings in accordance with the plans, specifications and Lake Forest Park standards, specifications, and requirements.
   2. Field locate and connections to existing sanitary sewer lines and pool plumbing.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Specifications, including but not limited to following:
   Section 31 20 00 Earthwork

1.3 REFERENCES

- **WSDOT-APWA** 2018 Standard Specifications for Road, Bridge and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.
- **COLFP** City of Lake Forest Park Code and Engineering Development Manual and Standard Plans


The International Association of Plumbing and Mechanical Officials (IAMPO) Standards.

1.4 DIMENSIONS AND LAYOUTS

A. See Paragraph 31 10 00 - 1.7.

B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.

C. The Contractor is responsible for review of all records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities damaged as a result of the Contractor’s operations at its own expense.

D. The Contractor is to notify the Engineer immediately of underground utilities encountered, which are not shown on the plans.

1.5 CONTRACTOR REQUIREMENTS

A. Contractor is responsible for coordinating all sanitary sewer work with COLFP and the Owner.

B. Contractor shall apply for and obtain all required permits from COLFP for sewer work.
C. Contractor shall locate all existing utilities for service connections.

D. Provide as-buils in accordance with COLFP requirements.

1.6 TEMPORARY BYPASSING

A. Existing sanitary sewer systems shall remain operational during construction. Contractor shall provide bypass systems as required by his operations and sequencing of installation of new improvements in order to ensure existing sanitary sewer system(s) maintains its functionality with no backups, flooding, or any other detrimental impacts. Coordinate all bypassing with Owner and utility provider. Obtain all required approvals prior to implementation.

PART 2 PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) PIPE

A. PVC pipe shall conform to Section 9-5.12 of WSDOT-APWA. Pipe shall be ASTM 3034, SDR 35 with rubber gasket joints.

2.2 COUPLINGS AND JOINTS

A. Pipe to pipe connections between pipes of differing materials shall be made with a flexible gasketed connector, adaptor or coupling-adaptor to make a watertight joint. Connector shall be Romac or approved equivalent.

2.3 SANITARY SEWER MANHOLES

A. Sanitary Sewer Manholes shall be in accordance with COLFP standards and the plans.

2.4 CLEANOUTS

A. Sanitary Sewer cleanouts shall be in accordance with COLFP standards and the plans.

2.5 FOAM BLOCKING

A. Plastic Foam for pipe protection and separation between pipes shall meet the Federal Spec. PPP-C-1752B Type 1, Class 2.

2.6 DETECTABLE WARNING TAPE

A. Detectable warning tape for plastic pipe shall be in accordance with 9-15.18 of WSDOT-APWA.

PART 3 EXECUTION

3.1 VIDEO VERIFICATION

A. Field locate all existing lines to be reused for pool area drain.

B. Provide video inspection of all existing sewer lines to be reused, per AHJ requirements. Video inspection shall extend to the connection point at the public sewer main.
3.2 TRENCHING

A. Excavation and preparation of the trench shall be in accordance with Section 7-08.3(1) of WSDOT-APWA and Section 31 20 00.

3.3 PIPE INSTALLATION

A. Pipe is to be installed in accordance with Section 7-08.3(2) of WSDOT-APWA, except that survey line and grade control hubs shall be provided by a survey crew working under the direction of a licensed land surveyor or licensed Engineer and shall be provided by the Contractor. Field locate existing sanitary sewer lines that are to be connected to. Install pipe at 2 Percent minimum slope. Protect installed pipe from temporary construction loads in accordance with manufacturer’s recommendations.

3.4 BEDDING AND BACKFILLING

A. Bedding shall be installed in accordance with Section 31 20 00.

B. Backfilling of trenches shall be in accordance Section 31 20 00. Install detectable warning tape for non-metallic pipe for full length of each pipe run. Tape shall be installed eighteen inches above the pipe crown.

3.5 CLEANING AND TESTING

A. Cleaning, testing and post construction video inspection shall be in conformance with Section 7-04.3(1) of WSDOT-APWA and COLFP. All new lines shall be subjected to testing and video inspection after installation. Tests shall be exfiltration test. Tests shall be conducted in the presence of the Engineer.

B. Contractor shall clean all structures prior to final acceptance.

END OF SECTION
PART 1  GENERAL

1.1  SECTION INCLUDES

A.  Work includes but is not limited to following:
   1.  Providing stormwater structures, cleanouts, and piping of the type and sizes designated in the plans and specifications.
   2.  Providing subsurface drainage for building and wall footings.
   3.  Providing connections to building roof drain systems.
   4.  Providing connections to existing facilities.
   5.  Providing storm drainage bypass piping and bypass pumping systems as required.

1.2  RELATED SECTIONS

A.  Coordinate related work specified in other parts of the Specifications, including but not limited to following:

   Section 312000 - Earthwork

1.4  REFERENCES

WSDOT-APWA  2018 Standard Specifications for Road, Bridge, and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.


COLFP  City of Lake Forest Park Code and Engineering Development Manual and Standard Plans

1.5  DIMENSIONS AND LAYOUT

A.  See Paragraph 31 10 00 - 1.7.

B.  The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.

C.  The Contractor is responsible for review of all records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities damaged as a result of the Contractor’s operations at its own expense.

D.  The Contractor is to notify the Engineer immediately of underground utilities encountered, which are not shown on the plans.

1.6  SUBMITTALS

A.  Submit manufacturer’s data on storm drain materials and equipment.
B. Submit shop drawings for infiltration tank.

C. Make all required submittals per COLFP for materials and work in ROW.

1.7 TEMPORARY BYPASSING

A. Existing storm drain systems shall remain operational during construction. Contractor shall provide bypass systems as required by his operations and sequencing of installation of new improvements in order to ensure existing storm drain system maintains its functionality with no backups, flooding, or any other detrimental impacts. Coordinate all bypassing with Owner and utility provider. Obtain all required approvals prior to implementation.

PART 2 PRODUCTS

2.1 STORM DRAINS, CULVERTS, OUTFALLS

A. Pipe material for storm drains shall be PVC or LCPE, unless indicated otherwise on the plans.

2.2 POLYVINYL CHLORIDE (PVC) PIPE

A. PVC pipe shall conform to Section 9-5.12 of WSDOT-APWA. Pipe shall be ASTM 3034, SDR 35 with rubber gasket joints.

B. Connections to structures shall be by GPK manhole adaptor.

2.3 CORRUGATED POLYETHYLENE PIPE (LCPE)

A. Corrugated polyethylene pipe (LCPE) shall be smooth interior wall pipe, conforming to AASHTO M252 or M294 with water-tight joints. Fittings and couplings shall be per manufacturer’s recommendations. LCPE shall be Hancor Blue Seal or approved equivalent.

B. Connections to structures shall be by LCPE adapter and GPK manhole adapter.

2.4 DUCTILE IRON PIPE

A. Ductile iron pipe shall be per ANSI A21.51 Class 50 with push-on joints. Provide ductile iron pipe for all pipe with less than 1.5-Feet of cover.

2.03 PERFORATED POLYVINYL CHLORIDE (PVC) PIPE

A. Perforated PVC pipe shall conform to Section 9-5.2(6) of WSDOT-APWA. Pipe shall meet the requirements of AASHTO M 252.

2.5 CATCH BASINS, AREA DRAINS, AND GRATES

A. Catch basins and area drains shall be as indicated on the plans and shall in accordance with COLFP standards and WSDOT-APWA standard plans.

B. Grates for catch basins and area drains shall be as indicated on the plans, and shall be bolt locking.

C. Catch basins and other structures shall conform to the details on the plans. Catch Basins shall be labeled with an approved plaque, tile, painted stencil, or pre-cast marking with the following: “NO DUMPING. DRAINS TO LAKE WASHINGTON” or approved design
2.6 DETECTABLE WARNING TAPE
   A. Detectable warning tape for plastic pipe shall be in accordance with 9-15.18 of WSDOT-APWA.

2.7 COUPLINGS AND JOINTS
   A. All joints and couplings shall provide a watertight connection testable with the storm drain lines upon which they are installed.
   
   B. Tees on existing pipe shall be connected by core drilling and flexible connections.
   
   A. Pipe to pipe connections between pipes of differing materials shall be made with a flexible gasketed coupling, adaptor or coupling-adaptor to make a watertight joint. Couplings shall be those manufactured by Romac or approved equivalent.

2.8 RIP RAP
   A. Rip Rap shall consist of 2-4” round river rock.

PART 3 EXECUTION

3.1 TRENCHING
   A. Excavation and preparation of the trench shall be in accordance with COLFP and Section 31 20 00.
   
   B. The trench shall be kept free from water until pipe is laid and backfilled. All surface water is to be diverted so as not to enter the trench. Boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a depth of 6 inches below the elevation of bottom of pipe.
   
   C. Dewatering shall be accomplished by using ditches, sumps and pumps depending on the groundwater level at the time of construction.

3.2 TEMPORARY BYPASSING
   A. Bypass systems shall be sized to accommodate all potential flows and prevent any detrimental effects to existing facilities and improvements.
   
   B. Contractor shall provide all pumps, piping, plugs, power supplies, and any other appurtenances, materials, equipment and labor required for installation, maintenance, monitoring, and removal of bypass systems.
   
   C. Provide monitoring as required to ensure functioning of system as required by operations.

3.2 PIPE INSTALLATION
   A. Pipe is to be installed in accordance with Section 7-08.3(2) of WSDOT-APWA, except that survey line and grade control hubs shall be provided by a survey crew working under the direction of a licensed land surveyor or licensed Engineer and shall be provided by the Contractor.
   
   B. Connections to building plumbing shall include necessary fittings to make vertical and horizontal transition. Coordinate of all points of connection (POC) and accommodate POC’s on plans with plumbing system.
C. Wall penetrations shall be made with sand collars.

D. Install casing and carrier pipe, insulators and end seals in accordance with manufacturer’s instructions. Insulators shall be placed at locations indicated below:
   1. One foot (1’) from each casing end
   2. One foot (1’) from each carrier pipe joint
   3. Six feet (6’) on center for the full length of carrier pipe

3.3 BEDDING AND BACKFILLING

A. Bedding shall be installed in accordance with Section 7-08.3(1)C of WSDOT-APWA.

B. Backfilling of trenches in the ROW shall be in accordance with COLFP, and the details in the plans. Backfilling of trenches on site shall be in accordance with Section 312000, and the details in the plans.

C. Install detectable warning tape for non-metallic pipe for full length of each pipe run. Tape shall be installed eighteen inches above the pipe crown.

3.4 STRUCTURE INSTALLATION AND ADJUSTMENT

A. Storm drain structures in the ROW shall be installed and adjusted in accordance with COLFP. Storm drain structures on site shall be installed and adjusted in accordance with Section 7-05.3 of WSDOT-APWA, except backfilling shall be per Section 31 20 00.

B. Verify orientation with proposed improvements including curbs and pavement edges.

C. Grout all adjustment sections and penetrations with non-shrink grout.

3.5 PERMANENT CONNECTIONS TO EXISTING SYSTEMS

A. Where indicated on the plans, make permanent connections to existing storm drain systems.

B. Where new pipe is to be connected to an existing structure, rebuild structure as necessary to provide an approved connection per the plans. Relocate ladders and other appurtenances to allow for new connection.

3.6 CLEANING AND TESTING

A. Cleaning and testing shall be in conformance with Section 7-04.3(1) of WSDOT-APWA and COLFP. All new lines shall be subjected to testing after installation. Tests shall be air pressure test unless otherwise required by COLFP. Tests shall be conducted in the presence of the Engineer.

B. Contractor shall clean all piping and structures prior to final acceptance. Do not flush debris into downstream system or infiltration facilities. Plug lowest outlet from site and remove all flushing water and debris and dispose of off-site.

END OF SECTION