

MISSION REACH
LONE STAR SITE EROSION PROJECT
BEXAR COUNTY, TEXAS

TECHNICAL SPECIFICATIONS

Prepared by:



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SECTION 100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Project consists of the installation of 225 linear feet of toewood along Mission Reach in San Antonio, Bexar County, Texas.

1. Project Name: Mission Reach – Lone Star Site Erosion Project
2. Project Location: Bexar County, Texas
3. Owner: San Antonio River Authority (SARA)

B. Designer Identification: The Contract Documents, dated December 10, 2018, were prepared for the Project by **Ecosystem Planning & Restoration (EPR)**. EPR is the Project Coordinator and Designer for this Project. Throughout the Specifications, the term Designer refers to EPR.

C. Contractor Identification: **To Be Determined** is the Contractor for this Project and is Project's Constructor. Throughout the Specifications, the terms "Construction Manager" and "Contractor" are synonymous and refer to **To Be Determined**.

D. The Work consists of:

- a. Approximately 225 linear feet of toewood installation.
- b. Installing and maintaining erosion and sediment control features for the life of the project.
- c. Seeding and planting of disturbed acreage, including temporary and permanent seeding as well as permanent tree and shrub plantings.
- d. All necessary incidentals described and illustrated in the Construction Documents.

1.3 CONTRACT

A. Project will be constructed under a general construction contract.

1.4 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.5 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections.

1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Specifications are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Specifications to determine numbers and names of sections in the Contract Documents.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations.

These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural,

and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section. Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

END OF SECTION 100

SECTION 101 – PROJECT MANAGEMENT AND COORDINATION

Part 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Project meetings.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Administrative Procedures: Coordinate scheduling and timing of required procedures with other construction activities to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Installation and removal of temporary facilities and controls.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Project closeout activities.
- C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.4 SUBMITTALS

- A. Staff Names: Within 15 days of starting construction operations submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.6 PROJECT MEETINGS

- A. General: The Designer shall schedule and conduct meetings and conferences at Project site, unless otherwise indicated and shall:

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Contractor of scheduled meeting dates and times.
 2. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Contractor, within 5 days of the meeting.
- B. Preconstruction Conference: The Designer shall schedule a preconstruction conference before starting construction, at a time convenient to Owner and Contractor, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. The Designer shall conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of the Owner, the Designer, the Contractor and its superintendent, major subcontractors, and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing.
 - d. Designation of responsible personnel.
 - e. Procedures for processing field decisions.
 - f. Procedures for processing Applications for Payment.
 - g. Distribution of the Contract Documents.
 - h. Submittal procedures.
 - i. Preparation of Record Documents.
 - j. Use of the premises.
 - k. Parking availability.
 - l. Office, work, and storage areas.
 - m. Equipment deliveries and priorities.
 - n. First aid.
 - o. Security.
 - p. Progress cleaning.
 - q. Working hours.
 3. Record significant conference discussions, agreements, and disagreements.
 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- C. Progress Meetings: The Designer shall conduct progress meetings as needed, at intervals not exceed two weeks and coordinate meetings with Preparation of payment requests.
1. Attendees: Representatives of the Owner, Designer, and Contractor shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to

Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

- b. Review present and future needs of each entity present, including the following:
 - 1) Sequence of operations
 - 2) Status of submittals
 - 3) Deliveries
 - 4) Access
 - 5) Site Utilization
 - 6) Work Hours
 - 7) Hazards and Risks
 - 8) Progress Cleaning
 - 9) Quality and work standards
 - 10) Documentation of information for payment requests
- 3. Reporting: Distribute minutes of the meeting to each party present and to parties who should've been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
- D. Schedule Updating: The contractor shall revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

END OF SECTION 101

SECTION 102 – CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 1. Preliminary Construction Schedule.
 2. Contractor's Construction Schedule.
 3. Submittals Schedule.
 4. Construction reports (Weekly).
 5. Field condition reports.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 1. Critical are activities on the critical path. They must start and finish on the planned early start and finish times.
 2. Predecessor activity is an activity that must be completed before a given activity can be started.
- B. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- C. Event: The starting or ending point of an activity.
- D. Float: The measure of leeway in starting and completing an activity
 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- E. Major Area: A story of construction, a separate building, or a similar significant construction element.
- F. Milestone: A key or critical point in time for reference or measurement.

1.4 SUBMITTALS

- A. Distribute copies of approved submittals to Designer, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.
- B. Submittals Schedule: Submit electronic copies of schedule. Arrange the following information in a tabular format:
 1. Scheduled date for first submittal.

2. Specification Section number and title.
 3. Submittal category (action or informational).
 4. Name of subcontractor.
 5. Description of the Work covered.
 6. Scheduled date for Designer's final release or approval.
- C. Contractor's Construction Schedule: Submit an electronic or hard copy of schedule. Include type of schedule (Preliminary, Initial or Updated) in the title of the file.
- D. Construction Reports: Submit an electronic copy.
- E. Field Condition Reports: Submit an electronic copy at time of discovery of differing conditions.

1.5 COORDINATION

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

PART 2 – PRODUCTS

2.1 SUBMITTALS SCHEDULE

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

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date.
- C. Activities: Treat separate areas as a separate number activity for each principal element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 30 days, unless specifically allowed by designer
 2. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule

3. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Designer's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 3. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Uninterruptible services.
 - b. Use of premises restrictions.
 - c. Seasonal variations.
 - d. Environmental control.
 4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Submittals.
 - b. Purchases.
 - c. Sample Testing.
 - d. Deliveries.
 - e. Installation.
 - f. Tests and inspections.
 - g. Adjusting.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Outline significant construction activities for the entire construction period.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit horizontal bar-chart-type construction schedule within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the entire construction period.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule before each regularly scheduled progress meeting.
 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Completion percentage for each activity.

2.5 REPORTS

- A. Construction Reports: Prepare a construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. Approximate count of personnel at Project site.
 - 3. General weather conditions.
 - 4. Accidents.
 - 5. Meetings and significant decisions.
 - 6. Unusual events (refer to special reports).
 - 7. Stoppages, delays, shortages, and losses.
 - 8. Meter readings and similar recordings.
 - 9. Emergency procedures.
 - 10. Orders and requests of authorities having jurisdiction.
 - 11. Construction Change Directives received.
 - 12. Substantial Completions authorized.
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

END OF SECTION 102

SECTION 103 – SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

1.3 DEFINITIONS

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

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of Construction Plans will be provided by Designer for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on the Designer's receipt of submittal.
 - 1. Initial Review: Allow 7 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Designer will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Allow 7 days for processing each resubmittal.
 - 4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- D. Identification: Place a permanent label or title block on each submittal for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Designer.
 - 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Designer.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.

- g. Name of manufacturer.
 - h. Unique identifier, including revision number.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- F. Additional Copies: Unless additional copies are required for final submittal, and unless Designer observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Designer will return submittals, without review, received from sources other than Contractor.
- 1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Designer on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
 - 2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 - 3. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Submittal and transmittal distribution record.
 - i. Remarks.
 - j. Signature of transmitter.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- 1. Use for Construction: Use only final submittals with mark indicating action taken by Designer in connection with construction.

PART 2 – PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.

- c. Manufacturer's installation instructions.
 - d. Manufacturer's catalog cuts.
 - e. Printed performance curves.
 - f. Operational range diagrams.
 - g. Mill reports.
 - h. Standard product operating and maintenance manuals.
 - i. Compliance with recognized trade association standards.
 - j. Compliance with recognized testing agency standards.
 - k. Application of testing agency labels and seals.
 - l. Notation of coordination requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
- 1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
- D. Coordination Drawings: Comply with requirements in Division 1 Section 101 "Project Management and Coordination"
- E. Samples: Prepare physical units of materials or products, including the following:
- 1. Comply with requirements in Division 1 Section 104 "Quality Requirements" for mockups.
 - 2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - 3. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - 4. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Designer's sample where so indicated. Attach label on unexposed side that includes the following:
 - a. Generic description of Sample.
 - b. Product name or name of manufacturer.
 - c. Sample source.

5. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, provide the following:
 - a. Size limitations.
 - b. Compliance with recognized standards.
 - c. Availability.
 - d. Delivery Time.
6. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.
 - a. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
7. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Designer will not return copies.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 3. Test and Inspection Reports: Comply with requirements in Division 1 Section 104 "Quality Requirements."
- B. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- C. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- D. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- E. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
- F. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

- G. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- H. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- I. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- J. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section 108 Closeout Procedures.
- K. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- L. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.
- M. Manufacturer's Field Reports: Prepare written documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - 1. Name, address, and telephone number of factory-authorized service representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.

- N. Material Safety Data Sheets: Submit information directly to Owner. If submitted to Designer, Designer will not review this information but will return it with no action taken.

PART 3 – EXECUTION

3.1 CONTRACTOR’S REVIEW

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Indicate on the submittal it is approved for submitting.

3.2 DESIGNER’S ACTION

- A. General: Designer will not review submittals that do not bear Contractor's approval mark and will return them without action.
- B. Action Submittals: Designer will review each submittal, make marks to indicate corrections or modifications required, and return it. Designer will mark each submittal with the necessary action required and will mark appropriately to indicate action taken.
- C. Informational Submittals: Designer will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Designer will forward each submittal to appropriate party.

END OF SECTION 103

SECTION 104 – QUALITY REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Designer.
- C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.5 REQUIREMENTS

- A. Copies of Regulations: Obtain copies of all applicable regulations and retain at Project site to be available for reference by parties who have a reasonable need. These include, but are not limited to:
 - 1. ASTM D 3740 – Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction, 2001
 - 2. ASTM E 329 – Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction, 2003

1.6 SUBMITTALS

- A. Qualification Data: For testing agencies specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Prior to start of work, include proof by qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.

4. Identification of test and inspection methods.
 5. Number of tests and inspections required.
 6. Time schedule or time span for tests and inspections.
 7. Entity responsible for performing tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests or inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Ambient conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspection.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgements, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance
- D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.
- G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, and that specializes in types of tests and inspections to be performed.
- H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
 1. Contractor responsibilities include the following:
 - a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
 - d. When testing is complete, remove assemblies; do not reuse materials on Project.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Designer, with a copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.8 QUALITY CONTROL

- A. Contractor Responsibilities: Unless otherwise indicated, employ and pay for all quality-control services specified and required by authorities having jurisdiction. The Contractor shall:
 1. Engage a qualified testing agency to perform all the required quality-control services.
 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Submit a certified written report, in duplicate, of each quality-control service.
 4. Also, be responsible for testing and inspecting requested by the Contractor and not required by the Contract Documents.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
 6. Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
 7. Regardless of whether original tests or inspections were Contractor's responsibility, the Contractor shall be responsible for providing quality-control services, including retesting and for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
 8. Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - a. Schedule times for tests, inspections, obtaining samples, and similar activities.
 9. Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.

- a. Distribute schedule to Owner, Designer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
- B. Testing Agency: The testing agency shall cooperate with Designer and Contractor in performance of duties and shall provide qualified personnel to perform required tests and inspections. The testing agency shall:
 1. Notify Designer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 5. Do not perform any duties of Contractor.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 104

SECTION 105 – REFERENCES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Designer's action on Contractor's submittals, applications, and requests, "approved" is limited to Designer's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Designer. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- K. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Designer for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Designer for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.
- E. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG Americans with Disabilities Act (ADA)

Accessibility Guidelines for Buildings and Facilities

Available from Access Board (800) 872-2253

www.access-boafd.gov (202) 272-5434

CFR Code of Federal Regulations

Available from Government Printing Office (888) 293-6498

www.access.gpo.gov/nara/cfr (202) 512-1530

CRD Handbook for Concrete and Cement

Available from Army Corps of Engineers

Waterways Experiment Station (601) 634-2355

www.wes.army.mil

DOD Department of Defense Specifications and Standards

Available from Defense Automated Printing Service (215) 697-6257
www.astimage.daps.dla.mil/online

FED-STD Federal Standard

(See FS)

FS Federal Specification

Available from Defense Automated Printing Service (215) 697-6257
www.astimage.daps.dla.mil/online

Available from General Services Administration

(202) 619-8925 www.fss.gsa.gov/pub/fed-specs.cfm

Available from National Institute of Building Sciences

(202) 289-7800 www.nibs.org

FTMS Federal Test Method Standard

(See FS)

MILSPEC Military Specification and Standards

Available from Defense Automated Printing Service (215) 697-6257
www.astimage.daps.dla.mil/online

UFAS Unif0ff11 Federal Accessibility Standards

Available from Access Board (800) 872-2253

www.access-board.gov (202) 272-5434

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(202)862-5100
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216)241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202)737-0202
AAMA	American Designerural Manufacturers Association www.aamanet.org	(847)303-5664
AAN	American Association of Nurserymen (See ANLA)	
AASHTO	American Association of State Highway and Transportation Officials www.aashto.org	(206)624-5800
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org	(910)549-8141
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202)257-2530
ACI	American Concrete Institute/ACI International www.aci-int.org	(248)848-3700
ACPA	American Concrete Pipe Association	(972)506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205)257-2530
AFPA	American Forest & Paper Association (See AF&PA)	
AF&PA	American Forest & Paper Association www.afapa.org	(800)878-8878
AGA	American Gas Association	(202)824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703)548-3118
AHA	American Hardboard Association www.hardboard.org	(847)934-8800
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202)872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859)288-4960
AIA	American Institute of Designers (The) www.aia.org	(800)242-3837 (202)626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800)644-2400 (312)670-2400
AISI	American Iron and Steel Institute www.steel.org	(202)452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303)792-9559
ALCA	Associated Landscape Contractors of America www.alca.org	(800)395-2522 (703)736-9666
ALSC	American Lumber Standard Committee	(301)972-1700

AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847)394-0150
ANLA	American Nursery & Landscape Association (Formerly: AAN – American Association of Nurserymen) www.anla.org	(202)789-2900
ANSI	American National Standards Institute www.ansi.org	(202)293-8020
AOSA	Association of Official Seed Analysis www.aosaseed.com	(505)522-1437
APA	APA – The Engineered Wood Association www.apawood.org	(253)565-6600
APA	Designersural Precast Association www.archprecast.org	(941)454-6989
API	American Petroleum Institute www.api.org	(202)682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703)524-8800
ASCA	Designersural Spray Coaters Association www.ascassoc.com	(609)848-6120
ASCE	American Society of Civil Engineers www.asce.org	(800)548-2723 (703)295-6300
ASHRAE	American Society of Heating, Refrigerating and Air- Conditioning Engineers www.ashrae.org	(800)843-2763
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(212)591-7722
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(404)835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	
AWCI	AWCI International (Association of the Wall and Ceiling Industries International) www.awci.org	(703)534-8300
AWCMA	American Window Covering Manufacturers Association (See WCMA)	
AWI	Designersural Woodwork Institute www.awinet.org	(800)449-8811 (703)733-0600
AWPA	American Wood Preservers' Association www.awpa.com	(817)326-6300
AWS	American Welding Society www.aws.org	(800)443-9353 (305)443-9353
AWWA	American Water Works Association www.awwa.org	(800)926-7337 (303)794-7711
BHMA	Builders Hardware Manufacturers Association	(212)297-2122

BIA	www.buildershardware.com Brick Industry Association (The)	(703)620-0010
BIFMA	www.bia.org BIFMA International (Business and Institutional Furniture Manufacturer's Association International)	(616)285-3963
CCC	www.bifma.com Carpet Cushion Council	(203)637-1312
CCFSS	www.carpetcushion.org Center for Cold-Formed Steel Structures	(573)341-4471
CDA	www.umr.edu/~ccfss Copper Development Association Inc.	(800)232-3282 (212)251-7200
CEA	www.copper.org Canadian Electricity Association	(613)230-9263
CFFA	www.canelect.ca Chemical Fabrics & Film Association, Inc.	(216)241-7333
CGA	www.chemicalfabricsandfilm.com Compressed Gas Association	(703)788-2700
CGSB	www.cganet.com Canadian General Standards Board	(819)956-0425
CIMA	www.pwgsc.gc.ca/cgsb Cellulose Insulation Manufacturers Association	(888)881-2462 (937)222-2462
CISCA	www.cellulose.org Ceilings & Interior Systems Construction Association	(630)584-1919
CISPI	www.cisca.org Cast Iron Soil Pipe Institute	(423)892-0137
CLFMI	www.cispi.org Chain Link Fence Manufacturers Institute	(301)596-2583
CPPA	www.chainlinkinfo.org Corrugated Polyethylene Pipe Association	(800)510-2772 (202)462-9607
CRI	www.cppa-info.org Carpet & Rug Institute (The)	(800)882-8846 (706)278-3176
CRSI	www.carpet-rug.com Concrete Reinforcing Steel Institute	(847)517-1200
CSA	www.crsi.org CSA International (Formerly: IAS – International Approval Services)	(800)463-6727 (416)747-4000
CSI	Construction Specifications Institute (The)	(800)689-2900 (416)747-4000
CSSB	www.csinet.org Cedar Shake & Shingle Bureau	(604)820-7700
CTI	www.cedarbureau.org Cooling Technology Institute (Formerly: Cooling Tower Institute)	(281)583-4087
DHI	ww.cti.org Door and Hardware Institute	(703)222-2010
EIA	www.dhi.org Electronic Industries Alliance	(703)907-7500
EIMA	www.eia.org EIFS Industry Members Association	(800)294-3462 (770)968-7945
EJMA	www.eifsfacts.com Expansion Joint Manufacturers Association, Inc.	(914)332-0040

	www.ejma.org	
FCI	Fluid Controls Institute	(216)241-7333
	www.fluidcontrolsinstitute.org	
FGMA	Flat Glass Marketing Association (See GANA)	
FM	Factory Mutual System (See FMG)	
FMG	FM Global (Formerly: FM – Factory Mutual System)	(401)275-3000
	www.fmgglobal.com	
FSC	Forest Stewardship Council	52 951 5146905
	www.fscoax.org	
GA	Gypsum Association	(202)289-5440
	www.gypsum.org	
GANA	Glass Association of North America Formerly: FGMA – Flat Glass Marketing Association	(785)271-0208
	www.glasswebsiet.com/gana	
GRI	Geosynthetic Research Institute	(215)895-2343
	www.drexel.edu/gri	
GTA	Glass Tempering Division of Glass Association of North America (See GANA)	
HI	Hydraulic Institute	(888)786-7744 (973)267-9700
	www.pumps.org	
HI	Hydronic Institute	(908)464-8200
	www.gamanet.org	
HMMA	Hollow Metal Manufacturers Association (See NAAMM)	
HPVA	Hardwood Plywood & Veneer Association	(703)435-2900
	www.hpva.org	
HPW	H.P. White Laboratory, Inc.	(410)838-6550
	www.hpwhite.com	
IAS	International Approval Services (See CSA)	
ICEA	Insulated Cable Engineers Association, Inc.	(770)830-03369
	www.icea.net	
ICRI	International Concrete Repair Institute, Inc.	(847)827-0830
	www.irci.org	
IEC	International Electrotechnical Commission	41 22 919 02 11
	www.iec.cj	
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)	(212)419-7900
	www.ieee.org	
IESNA	Illuminating Engineering Society of North America	(212)248-5000
	www.iesna.org	
IGCC	Insulating Glass Certification Council	(315)646-2234
	www.igcc.org	
IGMA	Insulating Glass Manufacturers Alliance (The)	(613)233-1510
	www.igmaonline.org	
ILI	Indiana Limestone Institute of America, Inc.	(812)275-4426
	www.iliai.com	

ISSFA	International Solid Surface Fabricators Association	(702)567-8150
I3A	International Imaging Industry Association (Formerly: PIMA – Photographic & Imaging Manufacturers Association) www.pima.net	(914)698-7603
ITS	Intertek Testing Services www.itsglobal.com	(800)345-3851 (607)753-6711
IWS	Insect Screening Weavers Association (Now defunct)	
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703)264-1690
LMA	Laminating Materials Association (Formerly: ALA – American Laminators Association) www.lma.org	(201)664-2700
LPI	Lightning Protection Institute www.lightning.org	(800)488-6864 (847)577-7200
LSGA	Laminated Safety Glass Association (See GANA)	
MBMA	Metal Building Manufacturers Association Www.mbma.com	(216)241-7333
MFMA	Maple Flooring Manufacturers Association www.maplefloor.org	(847)480-9138
MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org	(312)644-6610
MHIA	Material Handling Industry of America www.mhia.org	(800)345-1815 (704)676-1190
MIA	Marble Institute of America www.marble-institute.com	(624)228-6194
ML/SFA	Metal Lath/Steel Framing Association (see SSMA)	
MPI	Master Painters Institute www.paintinfo.com	(888)674-8937
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc. www.mss-hq.com	(703)281-6613
NAAMM	National Association of Designerural Metal Manufacturers www.naamm.org	(312)332-0405
NAAMM	North American Association of Mirror Manufacturers (See GANA)	
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(281)228-6200
NAIMA	North American Insulation Manufacturers Association (The) www.naima.org	(703)684-0084
NAMI	National Accreditation and Management Institute, Inc.	(304)258-5100
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800)557-2848
NCMA	National Concrete Masonry Association	(703)713-1900

	www.ncma.org	
NCPI	National Clay Pipe Institute www.ncpi.org	(414)248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202)775-3550
NEBB	National Environmental Balancing Bureau www.nebb.org	(301)977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301)657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207)829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703)841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(303)697-8441
NFPA	National Fire Protection Association www.nfpa.org	(800)344-3555 (617)770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301)589-6372
NGA	National Glass Association www.glass.org	(703)442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800)933-0318 (901)377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604)524-2393
NOFMA	National Oak Flooring Manufacturers Association www.nofma.org	(901)377-1818
NRCA	National Roofing Contractors Association www.nrca.net	(800)323-9545 (847)299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888)846-7622 (301)587-1400
NSA	National Stone Association (See NSSGA)	
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800)673-6275 (734)769-8010
NSSGA	National Stone, Sand & Gravel Association (Formerly: NSA – National Stone Association) www.nssga.org	(800)342-1415 (703)525-8788
NTMA	National Terrazzo and Mosaic Association, Inc. www.ntma.com	(800)323-9736 (703)779-1022
NWWDA	National Wood Window and Door Association (See WDMA)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312)786-0300
PDCA	Painting and Decorating Contractors of America www.pdca.com	(800)332-7322 (703)359-0826
PDI	Plumbing & Drainage Institute www.pdionline.org	(800)589-8956 (508)230-3516
PGI	PVC Geomembrane Institute //pgi-tp.ce.uiuc.edu	(217)333-3929

RCSC	Research Council on Structural Connections www.boltcouncil.org	(800)644-2400 (312)670-2400
RFCI	Resilient Floor Covering Institute www.rfci.com	Contact by mail only
RIS	Redwood Inspection Service www.calredwood.org	(888)225-7339 (415)382-0662
SAE	SAE International www.sae.org	(724)776-4841
SDI	Steel Deck Institute www.sdi.org	(847)462-1930
SDI	Steel Door Institute www.steeldoor.org	(440)899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabfurn.com	(516)294-5424
SGCC	Safety Glazing Certification Council www.sgcc.org	(315)646-2234
SIGMA	Sealed Insulating Glass Manufacturers Association (See IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843)626-1995
SMA	Screen Manufacturers Association www.screenmfgassociation.org	(561)533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703)803-2980
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD – The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800)523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850)434-2611
SPI/SPFD	Society of the Plastics Industry (The) Spray Polyurethane Foam Division (See SPFA)	
SPRI	SPRI (Single Ply Roofing Institute) www.spri.org	(781)444-0242
SSINA	Specialty Steel Industry of North America www.ssina.com	(800)982-0355 (202)342-8630
SSMA	Steel Stud Manufacturers Association (Formerly: ML/SFA – Metal Lath/Steel Framing Association) www.ssma.com	(312)456-5590
SSPC	The Society for Protective Coatings www.sspc.org	(877)281-7772 (412)281-2331
STI	Steel Tank Institute www.steel tank.com	(847)438-8265
SWI	Steel Window Institute www.steelwindows.com	(216)241-7333
SWRI	Sealant, Waterproofing, and Restoration Institute www.swrionline.org	(816)472-7974

TCA	Tile Council of America, Inc. www.tileusa.com	(864)646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703)907-7700
TPI	Truss Plate Institute	(608)833-5900
TPI	Turfgrass Producers International www.turfgrassof.org	(800)405-8873 (847)705-9898
UL	Underwriters Laboratories Inc. www.ul.com	(800)704-4050 (847)272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972)243-3902
USITT	United States Institute for Theatre Technology, Inc www.culturenet.ca/usitt	(800)938-7488 (315)463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800)424-2869 (202)244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800)283-1486 (503)639-0651
WCMA	Window Covering Manufacturers Association (See WCSC)	
WCSC	Window Covering Safety Council (Formerly: WCMA – Window Covering Manufacturers Association) www.windowcoverings.org	(800)506-4636 (212)661-4261
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA – National Wood Window and Door Association) www.wdma.com	(800)223-2301 (847)299-5200
WIC	Woodwork Institute of California www.wicnet.org	(916)372-9943
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800)550-7889 (530)661-9591
WWPA	Western Wood Products Association www.wwpa.org	(503)224-3930

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents

BOCA	Boca International, Inc. www.bocai.org	(708)799-2300
CABO	Council of American Building Officials (See ICC)	
IAPMO	International Association of Plumbing and Mechanical Officials (The) www.iapmo.org	(909)595-8449
ICBO	International Conference of Building Officials www.icbo.org	(800)284-4406 (562)699-0541
ICC	International Code Council, Inc.	(703)931-4533

(Formerly: CABO – Council of American Building Officials)

www.intlcode.org

SBCCI Southern Building Code Congress International, Inc. (205)591-1853
www.sbcii.org

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800)638-2772 (301)504-0990
DOC	Department of Commerce www.doc.gov	(202)482-2000
EPA	Environmental Protection Agency www.epa.gov	(202)260-2090
FAA	Federal Aviation Administration www.faa.gov	(202)366-4000
FDA	Food and Drug Administration www.fda.gov	(888)463-6332
GSA	General Services Administration www.gsa.gov	(202)708-5082
HUD	Department of Housing and Urban Development www.hud.gov	(202)708-1112
LBL	Lawrence Berkeley Laboratory (See LBL)	
LBLNL	Lawrence Berkeley National Laboratory www.lbl.gov	(510)486-5605
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301)975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800)321-6742 (202)693-1999
PBS	Public Building Service (See GSA)	
RUS	Rural Utilities Service (See USDA)	(202)720-9540
TRB	Transportation Research Board www.nas.edu/trb	(202)334-2934
USDA	Department of Agriculture www.usda.gov	(202)720-2791
USPS	Postal Service www.usps.com	(202)268-2000

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 105

SECTION 106 – PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance and other characteristics for purposes of evaluating comparable products of other named manufacturers.
- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a product and specifically endorsed by manufacturer to Owner.
- E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 - 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.

- e. Supplier's name and address.
- f. Installer's name and address.
- g. Projected delivery date or time span of delivery period.
- h. Identification of items that require early submittal approval for scheduled delivery date.
- 3. Initial Submittal: Within 30 days after date of commencement of the Work, submit an electronic copy of initial product list. Include a written explanation of omissions of data and for variations from Contract requirements.
 - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
- 4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
- 5. Designer's Action: Designer will respond in writing to Contractor within 15 days of receipt of completed product list. Designer's response will include a list of unacceptable product selections and a brief explanation or reasons for this action. Designer's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.
- B. Substitutions: Proposed substitutions to those specified herein can only be considered when submitted to the Designer with sufficient data to confirm material, product, or equipment equality. Submittals for proposed substitutions shall include the following information:
 - 1. Name, address, and telephone number of manufacturer and supplier as appropriate.
 - 2. Trade name, model or catalog designation
 - 3. Product data including performance and test data, reference standards, and technical descriptions of material, product, Of equipment. Include color, samples and samples of available finishes as appropriate.
 - 4. Detailed comparison with specified products including performance capabilities, warranties, and test results.
 - 5. Other pertinent data including data requested by Designer to confirm product equality.
 - 6. If a proposed material, product, or equipment substitution is deemed equal by the Designer to those specified
- C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section 103 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

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

PART 2 – PRODUCTS

2.1 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

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

2.2 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
 3. Refer to Divisions 2 through 16 for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section 108 "Closeout Procedures."

2.3 PRODUCT OPTIONS

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

6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "Of approved," comply with provisions in "Comparable Products" to obtain approval for use of an unnamed product.
- B. Product Selection Procedures: Procedures for product selection include the following:
1. Product: Where Specification paragraphs or subparagraphs "Product" name a single product and manufacturer, provide the product named.
 - a. Substitutions may be considered, unless otherwise indicated.
 2. Manufacturer/Source: Where Specification paragraphs or subparagraphs "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
 3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
 4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
 5. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
 6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
 7. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
 8. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Substitutions may be considered, unless otherwise indicated.
 9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Designer's sample. Designer's decision will be final on whether a proposed product matches satisfactorily.

- a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.
- 10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Designer will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Designer will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
- 11. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

2.4 PRODUCT SUBSTITUTIONS

- A. Timing: Designer will consider requests for substitution during construction.
- B. Conditions: Designer will consider Contractor's request for substitution when the conditions are satisfied. If the following conditions are not satisfied, Designer will return requests without action, except to record noncompliance with these requirements.
 - 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Designer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - 2. Requested substitution does not require extensive revisions to the Contract Documents.
 - 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - 4. Substitution request is fully documented and properly submitted.
 - 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 - 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - 7. Requested substitution is compatible with other portions of the Work.
 - 8. Requested substitution has been coordinated with other portions of the work.
 - 9. Requested substitution provides specified warranty.
 - 10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.5 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
 - 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, which it is consistent with the Contract Documents, and will produce the indicated results, and that it is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of Designers and owners, if requested.
5. Samples, if requested.

PART 3 – EXECUTION (Not Used)

END OF SECTION 106

SECTION 107 – EXAMINATION AND PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Mobilization
 - 2. Examination
 - 3. Preparation
 - 4. Construction Layout
 - 5. Field engineering and surveying
 - 6. General installation of products
 - 7. Progress cleaning
 - 8. Protection of installed construction
 - 9. Correction of the Work

1.3 SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 MOBILIZATION

- A. Mobilization shall include all activities and costs for transportation of personnel, equipment, and operating supplies to the site; establishment of offices, and other necessary facilities for the Contractor's operations at the site; premiums paid for performance and payment bonds, including co-insurance and re-insurance agreements as applicable; and other items as specified in this specification.
- B. Items of work to be performed in conformance with these specifications and construction details therefore are:
 - 1. This item shall consist of all work necessary to mobilize construction equipment, supplies and personnel as described above.
 - 2. The Contractor is required to properly and safely identify and secure the construction accesses, staging areas, and material handling areas. Prior to construction activities, the Contractor shall identify and mark boundaries of the staging areas as directed by the Engineer. Acceptable materials for identifying the construction areas include highly visible tape, road signs, barricades, cables, and safety fencing.
 - 3. Stockpile all construction materials, including stone, riprap, gravel, erosion control devices, etc. in the staging areas. Any soil materials that are stockpiled shall have a silt fence properly installed to ensure materials are contained. Silt fence installation shall comply with Division 2 Section 200"Temporary Erosion and Sedimentation Control."
 - 4. To limit the disturbance of soils on-site, the Contractor shall restrict the movement of all construction equipment within sensitive areas. Prior to construction activities, the Contractor

- shall identify the boundaries of all sensitive areas by using a highly visible tape or orange boundary fencing and will stake the limits of where construction equipment is permitted to travel, as directed by the Engineer.
5. The Contractor shall provide watertight tanks or barrels sealed with plastic sheets to be used to dispose of chemical pollutants, such as drained lubricating or transmission oils, greases, soaps, concrete mixer wash water, asphalt, etc., produced as a by-product of the construction work. At the completion of construction, facilities shall be legally disposed of without causing pollution.
 6. Chemical toilets shall be placed at least 100 feet from streams and in the staging area away from heavy equipment. At the completion of construction work, facilities shall be disposed of without causing pollution.
 7. The Contractor will identify all underground and aboveground utilities and is responsible for ensuring that these utilities are not damaged during construction. The Contractor will promptly notify the Engineer if there are conflicts between the utilities and the design.
 8. The Contractor will install construction accesses in accordance with Division 2 Section 200 "Temporary Erosion and Sedimentation Control."
 9. The Contractor shall comply with regulatory requirements and provide and/or coordinate traffic controls as necessary. The Contractor shall protect existing features to remain including curbs, pavement, and utilities. Maintain access for fire-fighting equipment and access to fire hydrants. Any damage to existing features must be replaced by the Contractor at their expense and approved by the appropriate regulatory authorities and Engineer.
 10. The Contractor shall properly remove and discard debris and trash.

3.2 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning Work, investigate and verify the existing conditions.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.3 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Designer not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Designer's written permission.
- C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a written request "Clarification or Request for Information (RFI)" for information to Designer as specified in the Contract Documents. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.4 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. Control datum for all of the construction-related surveys is that indicated on the construction plans. If discrepancies are discovered, notify Designer promptly.
- B. Option 1 (Preferred) - Contractor shall use the design plans to develop a three-dimensional digital model of the work, and utilize construction equipment with real-time GPS survey equipment equipped that can be used to accurately establish locations and grades.
- C. Option 2 (Traditional) - General: Contractor will engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels using survey instrumentation and similar appropriate means.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Notify Designer when deviations from required lines and levels exceed allowable tolerances.
 - 4. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
 - 5. At a minimum, the construction survey staking shall include the following:
 - a. Along the proposed thalweg at all points on tangents (PT's) and all points on curve (PC's). The stakes shall show the project station number.
 - b. At hub or radii points associated with all of the proposed horizontal curves along the proposed thalweg. The stakes shall show the curve number or description.
 - c. Along the proposed thalweg at proposed heads of riffles. The stakes shall show the project station number, proposed elevation, and depth of proposed cut/fill.
 - d. Along the proposed thalweg at proposed heads of runs. The stakes shall show the project station number, proposed elevation, and depth of proposed cut/fill.

- e. Along the proposed thalweg at proposed heads of pools. The stakes shall show the project station number, proposed elevation, and depth of proposed cut/fill.
 - f. Along the proposed thalweg at proposed heads of glides. The stakes shall show the project station number, proposed elevation, and depth of proposed cut/fill.
 - g. Along the proposed thalweg at the maximum pools. The stakes shall show the project station number, proposed elevation, and depth of proposed cut/fill.
 - h. Along the proposed thalweg at proposed heads of all of the proposed in-stream structures. The stakes shall show the project station number, proposed elevation, and depth of proposed cut/fill.
 - i. Along the proposed slope stake lines or limits of disturbance.
6. All stakes and control points shall be properly labeled and shall be flagged with survey flagging to make them clearly visible and distinguishable.
- D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Designer.
- E. Protection of Work: The Contractor shall use extra caution to avoid disturbance of all staking and survey control points at all times. If the Designer determines that an acceptable or unreasonable number of stakes and/or survey control points are disturbed by the Contractor during construction, the Contractor, at his own cost, will be required to perform re-staking of such points to the minimum requirements listed above and to the satisfaction of the Designer. The Contractor shall promptly report to the Designer the loss, destruction, or relocation of any reference or survey control point caused by changes in grade or other reasons. Any dislocated survey control points shall be replaced based on the original survey control and shall not be conducted without prior written notice from the Designer.

3.5 FIELD ENGINEERING

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

4. The proposed stream dimension (cross sectional area, width, and depth), pattern (horizontal location), and profile (elevations) will be verified regularly by the Designer.

3.6 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
- D. Waste Disposal: Burying or burning waste materials on-site will not be permitted, unless otherwise directed by the Designer. Washing waste materials down sewers or into waterways will not be permitted.
- E. During handling and installation clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- F. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- G. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

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

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction.
- B. Restore permanent facilities used during construction to their specified condition.

- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

PART 4 – UNIT PRICES

Unit Prices included on the Bid Form shall include full compensation for all required labor, products, materials, tools, equipment, plant, transportation, services and incidentals; erection, application, or installation of an item of the Work; operation and maintenance of an item of the Work throughout the life of the Contract; removal of a temporary item of the Work; overhead and profit.

4.1 MOBILIZATION

- A. Measurement Method: Lump Sum (LS)
- B. Includes: Movement of personnel, equipment, supplies and incidentals to the project site; the establishment of all facilities necessary for work on the project; the removal and disbandment of those personnel, equipment, supplies, incidentals, or other facilities that were established for the prosecution of work on the project; and for all other work and operations which must be performed for costs incurred prior to beginning work on the various items on the project site; including all materials, labor, equipment, tools, and incidentals necessary to complete the work as specified in the Contract Documents. If the lump sum fee for Mobilization exceeds 5% of the total contract price, any amount above the 5% shall be withheld until the final payment. Mobilization should not cover cost of bond premiums.

4.2 CONSTRUCTION LAYOUT

- A. Measurement Method: Lump Sum (LS)
- B. Includes: All construction survey staking, under the direction of an experienced Professional Land Surveyor, familiar with stream restoration construction projects, including required coordination with Designer; labor; equipment; tools; and incidentals, including, but not limited to stakes, flagging, nails, and painting necessary to complete work as specified in the Contract Documents. Or, all hardware, software, and experienced personnel necessary to translate the provided design files in DGN and XML formats to formats acceptable to GPS enabled, real time machinery; along with all equipment, instruments, tools, and personnel necessary to operate the machinery.

END OF SECTION 107

SECTION 108 – CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures
 - 2. Project Record Documents
 - 3. Final cleaning

1.3 FINAL INSPECTION

- A. Initial Walk-through: The Contractor shall schedule an initial walk-through with the Designer approximately 2 weeks prior to Project completion. The purpose of this walkthrough shall be for the Contractor to prepare an initial list of items to be completed and corrected (punch list) and reasons why the Work is not complete.
- B. Preliminary Final Inspection: The Designer shall schedule a Preliminary Final Inspection upon notification from the Contractor that the project is complete and ready for final inspection by the Designer. The purpose of this Preliminary Final shall be for the Contractor to prepare a final list of any outstanding items to be completed and corrected (punch list) and reasons why the Work is not complete.
 - 1. Before notifying the Designer that the project is complete and ready for Preliminary Final Inspection, the Contractor shall:
 - a. Have completed the items listed on the Initial Walk-through punch list.
 - b. Have prepared a list of any outstanding items to be completed and corrected (punch list) delinquent from the Initial Walk-through Inspection and reasons why the Work is not complete.
 - c. Advise Owner of pending insurance changeover requirements.
 - d. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - e. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - f. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - g. Terminate and remove temporary facilities from Project site, including, construction tools and similar elements.
 - h. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 - i. Complete and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - j. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 2. The Owner, Contractor, and Designer will determine the date for the Final Inspection.
 - 3. The Designer will prepare and distribute meeting minutes.

- C. Final Inspection: The Final Inspection will be scheduled at the Preliminary Final Inspection as noted above.
 - 1. At the final inspection, the designer shall, if job conditions warrant, record a list of items that are found to be incomplete or not in accordance with the contract documents. At the conclusion of the final inspection, the designer shall make the following determinations:
 - a. That the project is completed and accepted.
 - b. That the project is accepted subject to the list of discrepancies (punch list). All punch list items must be completed within thirty (30) days of acceptance.
 - c. That the project is not complete and another date for a final inspection will be established.
 - 2. Within fourteen (14) days of acceptance per Paragraph "c(1)" or within fourteen (14) days after completion of punch list per Paragraph "c(2)" above, the designer shall certify the work and issue applicable certificate(s) of compliance.
 - 3. Any discrepancies listed or discovered after the date of final inspection and acceptance under Paragraphs "c(1)" and "c(2)" above shall be handled in accordance with applicable warranties. The date of acceptance will establish the following:
 - a. The beginning of guarantees and warranties period.
 - b. The date on which the contractor's insurance coverage for public liability, property damage and builder's risk may be terminated.
 - c. That no liquidated damages (if applicable) shall be assessed after this date.
 - d. The termination date of utility cost to the contractor.

1.4 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. The contractor shall maintain at the job office, a day-to-day record of work-in-place that is at variance with the contract documents. Such variations shall be fully noted on project drawings by the Contractor and submitted to the Designer upon completion and no later than 30 days after acceptance of the project. Provide access to Project Record Documents for Designer's reference during normal working hours.
 - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
- B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
 - 1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar to prepare the marked-up Record Prints.
 - a. Accurately record information in an understandable drawing technique.
 - b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - c. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Changes made following Designer's written orders.
 - d. Details not on the original Contract Drawings.

- e. Field records for variable and concealed conditions.
- 3. Record information on the Work that is shown only schematically. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
- 4. Mark important additional information that was either shown schematically or omitted from original Drawings.
- 5. Note Construction Change Directive numbers, alternate numbers, and similar identification where applicable.
- 6. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
 - 1. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Record the name of the manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 - 5. Note related Record Drawings, and Product Data, where applicable.
- D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
 - 1. Include significant changes in the product delivered to Project site and changes in manufacturer's instructions for installation.
 - 2. Note related Record Drawings, and Record Specifications, where applicable.
- A. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers for final cleaning.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

- c. Remove tools, construction equipment, machinery, and surplus material from Project site.
- d. Leave Project clean and ready for occupancy.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Project property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 108

SECTION 200 – TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Gravel Construction Entrance
 - 2. Temporary Silt Fence
 - 3. Coir Fiber Matting
 - 4. Timber Mats
 - 5. Tree Protection Fence
 - 6. Turbidity Curtain

1.3 SUBMITTALS

- A. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- B. Material specification for posts used with silt fence.
- C. Certificate: Mill certificate for geotextile fabric attesting that fabric complies with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- D. Certificate: Mill certificate for coir fiber matting attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- E. Certificate: Mill certificate for tree protection fence attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- F. Certificate: Mill certificate for turbidity curtain attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- G. Material specification for all stone, both washed and unwashed.

PART 2 - PRODUCTS

2.1 MATERIALS

General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Designer. Provide materials suitable for use intended.

- A. Gravel Construction Entrance
 - 1. The geotextile fabric shall meet the requirements specified below.
 - 2. Stone shall be and 12 in riprap per 2014 TXDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, Item 432, Table 2 – Protection Riprap Stone Sizes.
- B. Temporary Silt Fence

1. Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths.
 - a. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D 4751.
 - b. Filtering efficiency: 85% minimum
 - c. Permittivity: 0.05-1, minimum, when tested in accordance with ASTM D-4491
 - d. Ultraviolet resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D-4355 after 500 hours of exposure
 - e. Tensile Strength: 100 lb-ft minimum, in cross machine direction; when tested in accordance with ASTM D-4632
 - f. Elongation: 20 percent maximum, when tested in accordance with ASTM D-4632
 - g. Tear Strength: 50 lb-ft minimum, when tested in accordance with ASTM D-4533
 - h. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
 2. Silt Fence Posts: One of the following, minimum 5 feet long:
 - a. Steel U- or T- section, with a minimum mass of 1.33 lb per linear foot with projections to facilitate attachment of fabric.
- C. Coir Fiber Matting:
1. Provide Coir Fiber Matting to meet the following specifications:
 - a. Brown in color
 - b. 100% coconut fiber (coir) twine woven into a high strength matrix
 - c. Thickness — 0.3 in minimum
 - d. Tensile Strength - 1348 x 6261 lb/ft minimum
 - e. Elongation - 34% x 38% max-in-1um
 - f. Flexibility (mg-cm)- 65030 x 29590
 - g. Flow Velocity- Observed 11 ft/sec
 - h. Weight - 20 oz/SY
 - i. Size - 6.6 x 164 ft (120 SY)
 - j. "C" Factor - 0.002
 - k. Open Area (measured) - 50%
 2. Stakes: 100% biodegradable hardwood stakes to secure the coir fiber matting. The wood stake must exhibit ample rigidity to enable being driven into hard ground, with sufficient flexibility to resist breakage.
 - a. Large Stakes: The wood stakes shall be 24 inches long and shall be 2 inches x 2 inches (nominal) in cross section. Each stake shall be pointed at one end to facilitate insertion through the matting matrix and also driving into the underlying ground. The opposing end of each stake shall have a notch cut out of one side in order to adequately grab the matting and anchor it securely in place. This notch shall be cut 2 inches from the end of the stake and shall be 2 inches long. The notch shall be cut horizontally into the cross section of the stake, with the notch cut then turning diagonally toward the pointed end of the stake for a length of 2 inches. The notch shall be cut deep enough into the cross section to securely anchor the matting, but not deep enough to cause the stake "head" to break during installation or subsequent typical application and use.
 - b. Small Stakes: The wood stakes shall be 11 inches long and shall be 1.5 inches x 1.5 inches (nominal) in cross section. Each stake shall be pointed at one end to facilitate insertion through the matting matrix and also driving into the underlying ground. The

opposing end of each stake shall be larger than the rest of the stake as shown in the Construction Drawings in order to adequately grab the matting and anchor it securely in place. The “head” of the stake shall be sufficient to securely anchor the matting, but the striking surface of the stake shall overlay the stake so as not to cause the stake "head" to break during installation or subsequent typical application and use.

3. Live cuttings: Live cuttings are specified in Section 401 —Plants.

D. Timber Mats:

1. Stone shall be and 12 in riprap per 2014 TXDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, Item 432, Table 2 – Protection Riprap Stone Sizes.
2. The geotextile fabric shall meet the requirements specified below.
3. Wood Mat:
 - a. Industry standard, pre-fabricated, pre-engineered wood bridge mat(s) with a minimum nominal mat dimension to bridge a 10-foot walking path as specified in the Construction Drawings.
 - b. Suitable materials to fill and/or cover voids between individual mats or individual timbers.
 - c. All wood bridge mats shall be portable such that they can be safely and easily installed, maintained, relocated, transported, and/or adjusted on-site using typical stream restoration construction equipment.

E. Tree Protection Fence:

- a. Mesh shall be orange in color, high density ultraviolet resistant polyethylene with a mesh opening of 4.0 Inches by 2.0 inches. The mesh shall be a minimum of 4 feet in height.
- b. Support posts shall be conventional metal "T" or "U" posts of sufficient length to support the specified mesh.
- c. Ties shall be plastic zip ties or wire material of sufficient strength to support the specified mesh.

F. Turbidity Curtain:

- a. Fabric shall be reinforced PVC coated fabric with rip-stop and yellow in color.
- b. The minimum net buoyancy shall be 6 inch / 15cm – 13 lb/ft / 19.2 kg/m.
- c. Floatation shall be 6 inches square and of EPS marine quality.
- d. Load carrying components shall consist of fabric and 3/16-inch galvanized steel chain with 3,000 lb break strength.
- e. The ballast shall be 0.41 lb. per foot galvanized chain.
- f. Connections shall be made with laced grommets or chain to chain.
- g. Minimum curtain depth shall be 5 ft.

G. Filter Fabric/Geotextile Fabric: The non-woven geotextile fabric shall meet the following:

Property	Minimum Average Roll Value
Grab Tensile	203 lbs.
Grab Elongation	50%
Mullen Burst	380 psi
Puncture	130 lbs.
Trapezoidal Tear	80 lbs.
UV Resistance	70% at 500 hours
AOS	100 Sieve
Permittivity	1.5sec ⁻¹
Flow Rate	110 gal/min ft ²

Roll Width	12.5 ft or 15 ft
Roll Length	300 ft or 360 ft
Estimated Gross Weight	295 lbs.
Area	500 SY

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time. No area shall be left disturbed overnight.

3.3 INSTALLATION

- A. Install devices per plans, per instructions of this section, Texas Commission on Environmental Quality, and per manufacturer’s instructions.
- B. Refer to plans for Construction Sequence.
- C. Gravel Construction Entrance:
 - 1. Locate and construct as shown on plans at a minimum depth of 8 inches of 4-in to 8-in aggregate.
 - 2. Clear the entrance and exit area of all vegetation, roots, and other objectionable material and properly grade it. Install reinforced concrete pipe in existing roadway ditches. Place the gravel and geotextile fabric to the specific grade and dimensions shown on the plans, and smooth it. Provide drainage to carry water to a sediment trap or other suitable outlet. Maintain the gravel pad in a condition to prevent mud or sediment from leaving the construction site. This may require periodic topdressing with Class A stone. After each rainfall, inspect any structure used to trap sediment and clean it out as necessary. Immediately remove all objectionable materials spilled, washed, or tracked onto public roadways.
 - 3. The project site shall be accessed through the designated access points illustrated on the Construction Drawings. The Contractor is responsible for maintaining access throughout all construction activities. Streets shall be cleaned with shovels or a street sweeper. Sediment shall be spread and seeded within the project disturbed area. Sediment on streets shall not be sprayed with water or disposed of in storm drains, ditches, or streams.
 - 4. Upon completion of construction, remove sediment and reseed any disturbed areas. Damage to any existing surface roads, curb and gutter, or vegetation adjacent to the designated construction entrances shall be repaired by the Contractor to a condition equal to that prior to damage. The Contractor shall be solely responsible for the costs of such repairs, and these costs shall not be part of this contract.
- D. Temporary Silt Fence
 - 1. Ensure that the height of the silt fence does not exceed dimensions shown on the plans above the ground surface in order to avoid exceeding the amount of impounded water, causing structure failure.
 - 2. Do not attach filter fabric to existing trees.
 - 3. Store and handle fabric in accordance with ASTM D-4873

4. Construct the silt fence from a continuous roll cut to the length of the barrier to avoid joints. When joints are necessary, securely fasten the filter cloth only at support post with overlap to the next post.
 5. Space posts a maximum of 6 feet apart. Support posts should be driven securely into the ground to a minimum of 18 inches. Staple or wire the silt fence fabric directly to posts.
 6. Excavate a trench approximately 4 inches wide and 8 inches deep along the proposed line of the posts and upslope from the barrier.
 7. Backfill the trench with compacted soil or gravel placed over the filter fabric.
 8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
 9. Remove all fencing materials and unstable sediment deposits and bring the area to grade and stabilize it after the contributing drainage area has been properly stabilized.
- E. Coir Fiber Matting: Coir fiber matting shall be used on all newly constructed channel banks from the water surface elevation to the limit of grading at the top of the bank or as specified by the Designer or as shown on the plans.
1. Apply temporary and permanent seed, fertilizer, other soil amendments, and mulch prior to installing matting.
 2. Install the coir fiber matting each day immediately upon completion of grading.
 3. Provide a smooth surface free from stones, clods, roots or debris that will prevent the contact of matting with the soil. Hand rake as required to smooth surface. Hand prune exposed roots that will prevent contact of the matting with the soil.
 4. Begin at the top of the slope by anchoring the blanket in a 6" deep by 6" wide trench with approximately 12" of blanket extended beyond the up-slope portion of the trench. Anchor the blanket with a row of stakes approximately 12" apart in the bottom of the trench. Backfill and compact the trench after staking. Apply seed to compacted soil.
 5. Secure coir fiber matting with large and small stakes as shown on the Construction Plans. Install matting in the direction of flow. The edges of parallel blankets must be staked with approximately 6" overlap depending on blanket type. Consecutive blankets spliced down the slope must be placed end over end (shingle style) with an approximate 6" overlap and secured in a trench as described above. Stake through overlapped area, approximately 2' apart across entire blanket width.
 6. Excess matting shall be trimmed and anchored in a trench at the end of the slope. The Designer may require adjustments in the trenching or stapling requirements to fit individual site conditions.
 7. Manufacturer's installation guidelines shall be utilized when more stringent than above.
- F. Timber Mat: Construct timber mat crossing to prevent damage to walking path. Have all necessary materials and equipment onsite before beginning installation.
1. Minimize clearing and excavation around walking path.
 2. Line walking path and access ramps area with geotextile fabric.
 3. Install timber mat at right angle to the path.
 4. Cover the geotextile fabric leading up to the timber mat with 12 in riprap so that equipment can drive onto the mat.
- G. Tree Protection Fence: Erect and maintain temporary fencing around tree protection zones and other areas of caution identified by Designer before starting site clearing. Remove fence when construction is complete.
1. Where intended to protect an individual tree, fence shall be installed just outside of the drip line of the tree. Where the drip line of adjacent trees overlap, the fence shall be installed just outside of the combined tree canopy drip line.

2. Where intended to protect an area from disturbance during construction activities or to prevent injury to individuals on site, the fence shall be installed along the perimeter of the area as determined by Designer.
 3. Support posts shall be spaced between 6 feet and 8 feet and shall be installed to a depth of not less than 1/3 of the total height of the post. The final post height for the tree protection and safety fence should be at least the height of the mesh.
 4. Ties shall be used to secure the mesh fence to the posts.
 5. A tension wire or wire fencing or mesh shall be used to support and prevent sagging of the fence.
 6. Do not store construction materials, debris, or excavated material within fenced area.
 7. Do not permit vehicles, equipment, or foot traffic within fenced area.
 8. Maintain fenced area free of trash.
 9. Do not excavate or otherwise disturb trees or other vegetation within tree protection zones, unless otherwise indicated.
 10. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible. Cover exposed roots with burlap and water regularly.
- H. Turbidity Curtain: Install turbidity curtain to isolate bank work and trap sediment loss from stream bank repair. Remove turbidity curtain when stream bank has achieved final stabilization and once approval has been obtained from the Designer.
1. Unbundle curtain as close to the water's edge as possible. The area should be free of sharp objects and abrasive surfaces.
 2. Place curtain sections next to each other until the proper length is achieved.
 3. Connect sections with ASTM "Slide" connectors and toggle pins if provided. Otherwise complete the connection of curtain sections with heavy duty zip ties and/or lanyards through the grommets at 6-inch intervals to depth. Skirt ends are reinforced with rope edges and should overlap to ensure a tight seal between sections. Finally connect the steel shackles on the stress plates on the bottom of the curtain sections.
 4. Anchor one end of the curtain to the shoreline using a Danforth or deadweight style anchor.
 5. Preset additional anchors in the stream or opposing shoreline in such a pattern to achieve the desired shape. If Danforth anchors are used, the anchor line shall be three times the water depth. If deadweight anchors are used, the anchor line should be one and a half times the water depth.
 6. Working from the anchored shoreline point out along the length of the curtain, tow the curtain into the desired location affixing the preset anchor lines. Once the full curtain has been deployed, anchor the free curtain end to the shoreline with a Danforth or deadweight style anchor.
 7. Cut the furling lines to deploy the curtain to depth.
 8. To remove, sever all anchor lines and drag curtain to shore. Collect all anchor devices and clear the area of any lines that may have been used to maintain the curtain.

3.4 MAINTAINENCE

- A. Inspect all devices, materials, and preventive measures weekly, at a minimum of every 7 days and within 24 hours after the end of any storm that produces 0.1 inches or more rainfall at the project site within a 24-hour period and daily during prolonged rainfall.
- B. Repair deficiencies immediately.

- C. Contractor shall not allow mud, earth droppings, dust, or debris to accumulate for more than one day on public streets or right of way before removing and disposing of material. Removal shall occur immediately if material creates a hazardous condition. Failure to remove material will result in Owner removing material and deducting cost of removal from the contract.
- D. Silt Fences:
 - 1. Promptly replace fabric of silt fence collapse, tear, decompose, or become ineffective unless need for fence has passed.
 - 2. Remove sediment deposits that exceed one-third of the height of the fence and as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence. Take care to avoid undermining the fence during cleanout.
 - 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Turbidity Curtain:
 - 1. While in service, the turbidity curtain should be inspected on a weekly basis and always after experiencing severe weather conditions. Removal of the curtain should be assessed prior to severe storms to avoid risk of damage or loss of the turbidity curtain.
 - 2. Inspections shall include:
 - a. Confirm that the design freeboard is being maintained. If freeboard is reduced, inspect the curtain skirt for marine growth, sediment or debris that might cause reduced freeboard. Check floats for damage.
 - b. Confirm that the curtain is maintaining its anchored profile. If the curtain or a portion thereof appears out of place, inspect the anchoring system and placement of the anchors. Adjust and/or repair the anchoring system as required.
 - c. Ensure the turbidity curtain has not moved into shallower water whereby the bottom of the curtain is resting on bottom.
 - d. The weight of the ballast chain can slowly work itself into the bottom soil over time and become lodged. When removing the turbidity curtain, the ballast chain can be held so securely by the soil that the skirt will tear away from the ballast chain pocket.
 - e. At 1-2 month intervals, the curtain should be inspected for U.V. radiation damage, chemical damage and for marine growth. Excessive marine growth can be removed by brushing or pressure washing while the curtain remains in the water, however, this may not be possible with turbidity curtain having deep skirt lengths.
 - f. While inspecting, look for areas where turbid water is escaping into the larger water body.
- F. Place sediment in appropriate locations on site approved by Designer; do not remove from site.

3.5 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Designer.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

PART 4 – UNIT PRICES

Unit Prices included on the Bid Form shall include full compensation for all required labor, products, materials, tools, equipment, plant, transportation, services and incidentals; erection, application, or installation of an item of the Work; operation and maintenance of an item of the Work throughout the life of the Contract; removal of a temporary item of the Work; overhead and profit.

4.1 GRAVEL CONSTRUCTION ENTRANCE

- A. Measurement Method: Per Each (EA)
- B. Includes: Class A washed stone, geotextile fabric, and reinforced concrete pipe necessary to complete work as specified in the Contract Documents.

4.2 TEMPORARY SILT FENCE

- A. Measurement Method: Linear Feet (LF)
- B. Includes: Fabric, posts, wire backing, and wire ties necessary to complete work as specified in the Contract Documents.

4.4 COIR FIBER MATTING

- A. Measurement Method: Square Yard (SY)
- B. Includes: Matting and stakes necessary to complete work as specified in the Contract Documents.

4.5 TIMBER MAT

- A. Measurement Method: Lump Sum (LS)
- B. Includes: Wood mats, geotextile fabric, temporary silt fence, and Class B stone necessary to complete work as specified in the Contract Documents.

4.6 TREE PROTECTION AND SAFETY FENCING

- A. Measurement Method: Linear Foot (LF)
- B. Includes: Wood posts, wood rails, poly barricade fabric and incidentals including, fabric, posts, wire backing, and ties necessary to complete work as specified in the Contract Documents.

4.7 TURBIDITY CURTAIN

- A. Measurement Method: Linear Feet (LF)
- B. Includes: Installation; maintenance and removal; labor; equipment; tools; and incidentals including, curtain, anchors, anchor line, lanyards, zip ties, and chain necessary to complete work as specified In the Contract Documents.

END OF SECTION 200

SECTION 301 – SITE CLEARING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes the following:
 1. Protecting existing trees, shrubs, groundcovers, plants, and grass to remain
 2. Removing existing trees, shrubs, groundcovers, plants, and grass
 3. Clearing and grubbing
 4. Exotic vegetation removal
 5. Stripping and stockpiling topsoil
 6. Debris removal
 7. Select tree removal

1.3 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials. Topsoil shall generally be considered the upper 6 inches of soil, including any organic materials contained within this zone.
- B. Subsoil: All soil materials beneath the topsoil layer down to the interface with parent material such as saprolite or bedrock.
- C. Debris: All materials identified by the Designer that are to be removed from the project site and disposed of off-site.
- D. Select trees: Existing on-site native species hardwood trees identified by the Designer that are to be removed and salvaged for use in the construction of in-stream structures.
- E. Exotic vegetation: Undesirable, non-native, invasive species trees, shrubs, and grasses. Examples include, but are not limited to: Chinese Privet (*Ligustrum sinense*), Kudzu (*Pueraria lobata*), Tree of Heaven (*Ailanthus altissima*), Silverberry (*Elaeagnus pungens*), Autumn-olive (*Elaeagnus umbellata*), Japanese Honeysuckle (*Lonicera japonica*), and Muláflora Rose (*Rosa multiflora*).
- F. Herbicide: Any commercially available herbicide designated and suitable for extermination of trees, shrubs, and grasses.

1.4 SUBMITTALS

- A. Herbicide:
 1. Product data: Provide material specifications for all herbicides to be used.
 2. Manufacturer's instructions: Indicate application procedures recommended by herbicide manufacturer. At a minimum, include application rate, hazards to humans and animals, application equipment required, and environmental conditions required.

1.5 QUALITY ASSURANCE

- A. Exotic Vegetation Removal
 1. Herbicide:

- a. Installer Qualifications: Company specializing in performing in the work of this section with minimum 5 years of experience and a commercial license as required by the State of Texas Department of Agriculture.
 - b. Comply with current Texas Agriculture Code, Chapter 76: Pesticide and Herbicide Regulation and all applicable federal laws for all work of this section, including, but not limited to purchase, transport, storage, application, and disposal of chemical herbicide.
 - c. Apply herbicide during weather, wind, and temperature conditions and the appropriate season as recommended by the herbicide manufacturer.
2. The Designer will periodically observe the application of herbicide and removal of vegetation by hand cutting and excavation to insure compliance with the specified methods.

1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on project property where indicated.
- C. Do not commence site clearing operations until all temporary erosion and sediment control measures are in place and are approved by the Designer.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 3 Section 302 "Earth Moving."
 - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original as acceptable to Owner.

3.2 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Remove or grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
 - 4. Use only hand methods for grubbing within tree protection zone.
 - 5. Chip removed tree branches and stockpile in areas approved by Designer.
- B. Salvaged vegetation:

1. Sod, shrubs, trees, or other vegetation to be salvaged for transplanting will be identified by the Designer.
 2. All vegetation transplanting shall be conducted as specified in Section 401 – Plants.
 3. The Contractor shall coordinate all clearing and grubbing activities in order to facilitate identification and marking of all vegetation transplants by the Designer.
 4. The Contractor shall coordinate and conduct all clearing and grubbing activities such that the probability of successful harvesting and replanting of all vegetation is maximized.
- C. Vegetation removed:
1. Do not burn, bury, landfill, or leave on site, except as directed by the Designer. Dispose of all cleared material off site.
 2. Re-use tress, rootwads, plants, and sod only as directed by the Designer for the construction of in-stream or habitat structures, or transplants.
 3. Chipped, ground, crushed, or shredded vegetation may be used for mulching, composting, or other purposed on-site as directed by the Designer.
- D. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.3 SELECT TREE REMOVAL

- A. The Contractor is directed to salvage native species hardwood trees as directed by the Designer. Select tree removal shall be considered incidental to clearing and grubbing.
1. Trees of basal diameter greater than 12 inches with root mass intact for use as rootwad or other instream or habitat structures as directed by the Designer
 2. The branches of such trees shall be removed and the trunk and rootball shall remain intact for a 12 foot to 30-foot total length.
 3. Root and truck sections shall be stockpiled in the designated staging areas.
 4. Additional native species hardwood tree trunk sections 10 inches to 24 inches in diameter may be utilized as footer logs and other instream or habitat structures.
 5. Branches and any excess trunk material shall be disposed of offsite or as directed by the Designer.

3.4 EXOTIC VEGETATION REMOVAL

- A. The Contractor is directed to remove exotic vegetation as directed by the Designer. Exotic vegetation removal shall be considered incidental to clearing and grubbing.
1. Removal of exotic vegetation accessible to heavy equipment, as determined by the Designer, shall be removed, handled, disposed of, etc. as any other vegetation as described under this specification.
 2. Removal of exotic vegetation not accessible to heavy equipment, as determined by the Designer, shall be removed by saw cutting and/or by hand excavation.
 - a. Hand dig or grub up smaller plants, including herbaceous vegetation, entirely.
 - b. Cut off roots and trunks or larger plants flush with existing grade.
 - c. Immediately apply herbicide to freshly exposed sections of the trunk and/or roots per the herbicide manufacturer's instructions for a single application.
 - d. The Contractor is responsible for confirming, before beginning removal of any exotic vegetation by these methods, that the application of herbicide is conducted in compliance with the correct environmental conditions, including weather, wind, temperature, and well as growing season, specified by the herbicide manufacturer.

- e. All removed vegetation shall be removed, handled, disposed of, etc. as any other vegetation as described under this specification.
- B. The sequence of all exotic vegetation removal shall be appropriately coordinated with the other project activities, including clearing and grubbing, earthwork, and planting.

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and non-soil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
 - 2. When soil or weather conditions are unsuitable, the Contractor shall cease topsoil stripping and salvage operations until directed by the Designer to resume.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Limit height of topsoil stockpiles to 72 inches.
 - 2. Do not stockpile topsoil within tree protection zones.
 - 3. Dispose of excess topsoil as specified for waste material disposal.
 - 4. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.
 - 5. All topsoil stockpiles shall be clearly labeled such that they are easily differentiated from other stockpiled materials.
 - 6. Topsoil piles should not be seeded. Topsoil piles shall be immediately and thoroughly covered with mulch. The piles shall be occasionally re-mulched in order to maintain a consistent cover until they are utilized.
- D. Salvaged topsoil shall be placed and spread evenly to a depth of 3 inches on top of subsoil materials to final grades. See Section 302 "Earth Moving" and Section 400 "Seeding" for coordination and sequencing between topsoil placement and other grading and planting activities, including ripping and discing.
 - 1. Where topsoil is to be placed, scarify surface to a depth of 6 inches.
 - 2. Place topsoil in areas where seeding and planting are indicated until all suitable topsoil stripped on-site is exhausted. Use any remaining suitable topsoil on-site as directed by the Designer. If quantity of suitable topsoil stripped from the site is not adequate for areas to be seeded and planted, no additional topsoil shall be imported from off-site, unless otherwise specified in the contract documents or by the Owner.
 - 3. Place topsoil during dry weather. When soil or weather conditions are unsuitable, the Contractor shall cease topsoil placement operations until directed by the Designer to resume.
 - 4. Topsoil shall be hand placed near plants to prevent damage to the plants.
 - 5. Remove roots, weeds, rocks, trash, and other foreign materials when placing topsoil.

3.6 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and all other waste materials including trash and debris, and legally dispose of them off Owner's property.
 - 1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.
 - 2. Organic materials from the clearing and grubbing activities that are chipped or shredded shall be used on-site as mulch as directed by the Designer.

3. Except for stripped topsoil or other materials indicated to remain on the Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

PART 4 – UNIT PRICES

Unit Prices included on the Bid Form shall include full compensation for all required labor, products, materials, tools, equipment, plant, transportation, services and incidentals; erection, application, or installation of an item of the Work; operation and maintenance of an item of the Work throughout the life of the Contract; removal of a temporary item of the Work; overhead and profit.

4.1 CLEARING AND GRUBBING

- A. Measurement Method: Lump Sum (LS)
- B. Includes: Clearing and grubbing within the construction limits shown on the plans; select tree removal; exotic vegetation removal, including removal with heavy equipment and/or saw cutting and hand excavation, providing and applying herbicide; topsoil stripping; including all topsoil excavation, handling, segregating, stockpiling, placement or reusing, and disposal of all materials associated with clearing and grubbing, and incidentals necessary to complete work as specified in the Contract Documents.

END OF SECTION 301

SECTION 302 – EARTH MOVING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes the following:
 1. Preparing subgrades for seeding and exterior plants
 2. Excavating and backfilling for stream construction
 3. Excavating and backfilling for in-stream structures
 4. Excavating and backfilling for demolition and structure removal.

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- C. Excavation: Removal of material, regardless of its nature or composition, encountered above subgrade elevations and to lines and dimensions indicated. All material excavated, regardless of its nature or composition, is considered Unclassified Excavation and may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 1. Authorized Additional Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Designer.
 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Designer. Unauthorized excavation, as well as remedial work directed by Designer, shall be without additional compensation.
- D. Fill: Soil materials used to raise existing grades.
- E. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, fill, or topsoil materials.

1.4 SUBMITTALS

- A. Materials Source: Submit name and location of source of all off-site soil materials.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for ditch plugs.
 2. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for reinforced concrete pipe bedding and backfill.
 3. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for construction of the pole barn building pad.
 4. Laboratory compaction curve according to ASTM D 698 and ASTM D 1557 for each on-site and borrow soil material proposed for ditch plugs.
- C. Shop Drawings: Indicate the intended rock removal method.

1.5 QUALITY ASSURANCE

- A. Blasting: Use of explosives, for any purpose, is prohibited.
- B. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740.
- C. Where fill materials are specified by reference to a specific standard, the Contractor shall be responsible for testing and analyzing samples for compliance before delivery to site. If such testing indicates that materials do not meet specified requirements, change material and retest.

1.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Designer and then only after arranging to provide temporary utility services according to requirements indicated.
 - 1. Notify Designer not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Designer's written permission.
 - 3. Contact utility-locator service for area where Project is located before commencing with any excavation activities.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soil Materials for use as general fill or backfill (non-structural for use in all areas except ditch plugs): ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, AASHTO M 145 soil Classification Groups A-I, A-2-4, A-2-5, and A-3, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. The ASTM D 4318 plasticity index should not exceed 30 for suitable satisfactory materials (25 for satisfactory material within 3 feet of proposed finished subgrade), nor should the liquid limit exceed 60. Soil testing service shall confirm that soil materials are acceptable for use as fill. During wet weather significant discing and drying of on-site soils may be required for use as fill material. No additional cost or time extension will be granted for soil discing and/or drying. The suitability of all soil materials for their intended use shall be subject to the approval of the Designer.
- C. Unsatisfactory Soils for use as general fill or backfill (non-structural for use in all areas except impervious stream channel plugs): ASTM D 2487 Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT, AASHTO M 145 soil Classification Groups A-26, A-2-7, A-4, A-5, A-6, and A-7, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils that:
 - a. Are not free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
 - b. Have the ASTM D 4318 plasticity index exceeding 30.
 - c. Are not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Select Fill: Material used for ditch plugs: ASTM D 2487 Soil Classification Groups CL, CH, MH, CL-ML, or SC. Material shall be able to achieve a maximum hydraulic conductivity of 1×10^{-5} cm/sec or less when compacted to 95% of a standard Proctor maximum dry density. Material shall be obtained from an off-site borrow source or material excavated on site if

approved by soil testing service and the Designer. The soil testing service shall determine an acceptable range of moisture content and dry unit weight in order to achieve the required permeability.

- E. Bedding and backfill for reinforced concrete pipe culverts: Material shall be coarse sands and gravels with maximum particle size of 1-1/2 inches, including graded sands and gravels containing small percentages of fines, granular, non-cohesive material, soil types GW, GP, SW, and SP in accordance with ASTM D 2487. Material used for bedding and backfill shall be obtained from an off-site borrow site source or material excavated on site approved by soil testing services. The material shall be free of mud, refuse, construction debris, organic material, rock greater than 1-1/2 inches, or frozen material.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect project benchmarks and survey control points, structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Stake and flag locations of all utilities.
- C. Identify required lines, levels, contours, and datum.
- D. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 3 Section 301 "Site Clearing."
- E. Protect and maintain erosion and sediment controls, which are specified in Division 2 Section 200 "Temporary Erosion and Sediment Control," during earthwork operations.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate for stream channel, stream banks, in-stream structures and other miscellaneous site features to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 - 2. Use care not to cause instability or displacement of the underlying or adjacent materials during excavation.

3.5 EXCAVATION FOR IN-STREAM STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing boulders, geotextile fabric, and stone backfill, as well as for other construction, and for inspections.
 - 1. Excavations for Footer Boulders: Do not disturb bottom of excavation. Trim bottom of excavations intended as bearing surfaces carefully to required lines and grades to leave solid base to receive other work.
 - 2. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of footer and header boulders. Shape subgrade to provide continuous support for all boulders, logs, rootwads, and other in-stream structure materials.

3.6 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation without altering top elevation.
 - 1. Fill unauthorized excavations under other construction as directed by Designer.

3.7 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
 - 2. Stockpiles depths should not exceed 8 feet in height in order to avoid undesired compaction.

3.8 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Completing construction of in-stream structures, including constructing sills, hand-filling the gaps and voids between the boulders in structure, and placing geotextile fabric and stone backfill behind the structure arms.
 - 2. Removing trash and debris.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.
- C. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- D. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- E. Other soil materials, such as a drainage course or subbase or base courses, may still be required over fill.
- F. Under planted areas, use satisfactory soil material.

3.9 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.10 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Under structures, including pipe trenches, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Under areas to be planted, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
- D. In areas where the existing channel will be abandoned, and impervious stream channel plugs are not specified, channel fill shall be placed in the abandoned channel. Proposed channel fill shall be compacted to a density comparable to the adjacent undisturbed material and approved as such by the Designer during and after placement. Organic material in channel fill shall not exceed 10% of the total volume of fill material used. This requirement is intended to prohibit organic waste material such as trees, shrubs, stumps, etc. from being buried in the abandoned channel.

3.11 GRADING

- A. General: Grade proposed stream channel bed, banks, and benches as shown on the plans and as directed by the Designer. Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth, natural transition between adjacent existing grades and new grades and at all inflection points.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
 - 3. The subgrade and topsoil are to be rough graded to promote surface water storage, with depressions and organic matter spread throughout.
 - 4. When grading through roots near areas with existing trees and shrubs to be protected, cut roots with a sharp axe or similar implement.
 - 5. Field conditions may dictate necessary adjustments to the grading plans. In such cases, the Designer shall indicate such adjustments to the Contractor. Adjustments may include, but are not limited to, spot grading in areas where sod, shrub, or tree transplants need to be planted and in areas where avoidance of existing trees is desired. Grading in such areas will be on a site-specific basis since each foot mass will have different dimensions.
 - 6. Create microtopography within the oxbow ponds and vernal pools.
- B. Site Grading: Slope grades to direct water in order to prevent pond-ing. Finish subgrades to required elevations within the following tolerances:
 - 1. Areas to be planted: Plus or minus 1 inch.
 - 2. Stream bed, banks, and benches: Plus or minus 1 inch.

3.12 RIPPING AND DISCING

- A. After the completion of final grading and within 5 days of permanent or temporary seeding or planting, the Contractor shall loosen the subgrade of all areas outside the bankfull channel to be planted by plowing or ripping in a cross hatch pattern, to a minimum depth of 18 inches, followed

by discing. Areas include areas compacted by vehicles or equipment, such as haul roads, staging areas, and stockpiling areas.

1. Ripping and discing operations shall be conducted only after topsoil has been placed.
 2. Ripping and discing should not be conducted at the ditch plugs.
 3. The Designer may waive the requirement to disc after the plowing or ripping treatment if he determines that the soil conditions do not warrant discing.
 4. Oxbow ponds and vernal pools shall not be ripped or disced, unless otherwise directed by the Designer.
 5. In the event bedrock is encountered, the Contractor will not be required to continue ripping in the particular area where the bedrock is encountered.
 6. Ripping and discing activities shall not take place during wet periods or immediately following large rain events.
 7. The Contractor shall avoid disturbing existing vegetation while completing the ripping and discing activities.
- E. In the event that tree and shrub planting will not be conducted during or immediately following construction because such timing does not coincide with the specified planting season, the Contractor shall proceed with ripping and discing activities, immediately followed by temporary and permanent seeding. Once the next specified planting season for tree and shrub planting arrives, the Contractor shall complete such planting. Depending upon the site conditions at this time as well as the time elapsed since the initial ripping and discing treatment, additional ripping and discing as described above may be required at the direction of the Designer. In the case that such additional ripping and discing is deemed necessary, the areas re-disturbed by such activities shall be replanted with temporary and permanent seeding.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: The Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing for ditch plugs.
- B. Perform compaction density testing in accordance with ASTM D1 556, ASTM D2167, ASTM D6938, or ASTM D6938.
- C. Evaluate results of compaction testing in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard proctor"), ASTM D 1557 ("modified proctor") or AASHTO T 180.
- D. Allow testing agency to inspect and test subgrades and each fill or backfill layer for the ditch plugs. Test for in-place density shall be performed at a minimum frequency of one test for every 2,500 square feet per 8-inch lift. Additional testing will be required if recommended by the testing agency at no additional cost to the Owner.
- E. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- F. Over excavated areas shall be backfilled flush to required elevation and have a compaction density of 97 percent of maximum dry density.
- G. Other areas including general fill shall have a compaction density of 90 percent of maximum dry density. General fill does not require compaction testing.
- H. When testing agency reports that subgrades, fills, or backfills for the ditch plugs have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.14 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Designer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.15 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the project property.

PART 4 – UNIT PRICES

Unit Prices included on the Bid Form shall include full compensation for all required labor, products, materials, tools, equipment, plant, transportation, services and incidentals; erection, application, or installation of an item of the Work; operation and maintenance of an item of the Work throughout the life of the Contract; removal of a temporary item of the Work; overhead and profit.

4.1 EXCAVATION

- A. Measurement Method: Lump Sum (LS)
- B. Includes: Excavating all material, regardless of its nature or composition, to required elevations, including oxbow ponds and vernal pools; fill and backfill, including all required compaction; grading; loading; hauling; stockpiling; disposal of acceptable excess material on site; disposal of unacceptable off site in a permitted area; providing and implementing an erosion and sedimentation control plan and permit, as well as any other required permit(s), for the location(s) off site where/if any materials are disposed of offsite; and testing by soil testing service. Payment will not be made for over-excavated work nor for replacement materials.

END OF SECTION 302

SECTION 400 – SEEDING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Permanent Seeding
 - 2. Temporary Seeding
 - 3. Maintenance

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- C. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.
- D. Subsoil: subsurface soils found between the 6-inch depth and the interface with parent material such as saprolite or bedrock.
- E. Topsoil: the upper 6 inches of undisturbed soil and any organic materials contained within. See also Section 301 “Site Clearing” for definition of topsoil that has been stockpiled during site clearing.

1.4 SUBMITTALS

- A. Certification of Seed: The Contract Documents list the herbaceous, permanent, and temporary seed and/or seed mixtures required. For each seed or seed mixture, a certificate of analysis stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed must be obtained from the respective seed vendor. Include the production date and location, and the packaging date and location.
 - 1. Certification of each seed mixture and/or seed mixtures; identifying the source, including name and telephone number of suppliers.
 - 2. All seed and seed mixtures shall be certified that the Pure Live Seed (PLS) percentage is equal to or greater than that which is specified on the seeding schedule. If the PLS is less than specified, the Contractor shall increase the seeding rate to compensate for the PLS difference at his own expense.
 - 3. All seed and seed mixes shall be free from commonly known State and Federal prohibited noxious weed seeds.
 - 4. The Designer must approve all seed and seed mixtures prior to the start of work. The designer will periodically verify all seed and seed mixtures during the application (sowing) process to insure their overall quality and correctness.
- B. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.
- C. Qualification Data: For Installer.
- D. Material Test Reports: For existing surface soil and imported topsoil.
- E. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful permanent and temporary herbaceous vegetation establishment.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
 - 1. Report suitability of topsoil for permanent and temporary herbaceous vegetation growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver and store all seed in original sealed, labeled, and undamaged containers. Onsite storage of seed must be approved by the Designer.
 - 2. Soil Amendments: Deliver and store all soil amendments (lime and fertilizer) in original sealed, labeled, and undamaged containers. Containers for fertilizer and lime shall be waterproof and shall show the weight, chemical analysis and name of the manufacturer clearly visible on the container/bag.

1.7 SCHEDULING

- A. Seeding Restrictions: Sow seed during the periods specified in the permanent and temporary seed tables in the Contract Documents. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
- B. Weather Limitations: Proceed with seeding only when existing and forecasted weather conditions have been deemed suitable. Extreme periods of heat, cold, drought, or rainfall shall be reviewed and discussed with the Designer.

1.8 MAINTENANCE OF SEEDED AREAS

- A. Begin maintenance immediately after each area is planted and until herbaceous vegetation is well established and exhibits a vigorous growing condition, but for not less than the following period:
 - 1. Seeded Areas: 60 days from date of Substantial Completion.
 - a. When full maintenance period has not elapsed before end of planting season, or if seeded area is not fully established, continue maintenance during next planting season.
- B. Maintain seeded areas by watering, fertilizing, weeding of undesirable species, replanting, and other operations. Regrade, and replant, and remulch bare or eroded areas.
 - 1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.
- C. Watering: Provide and maintain temporary piping, hoses, and watering equipment to convey water from sources and to keep seed bed uniformly moist to a depth of 4 inches.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water at a minimum rate of 1 inch per week.

PART 2 – PRODUCTS

2.1 SEED

- A. Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: Obtain a sufficient amount of seed or seed mixture stock such that amount of Pure Live Seed (PLS) complies with the rates and species listed in the Contract Documents (Amount of seed stock Application Rate / Percent PLS of seed stock).

2.2 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 1.5 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth as directed by the Designer.
 - a. Supplement with imported or manufactured topsoil from off-site sources when on-site quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.
 - 2. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

2.3 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

2.4 FERTILIZER

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.5 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.6 EROSION-CONTROL MATERIALS

- A. Coir fiber matting and anchors as specified in Division 1 "Temporary Erosion and Sediment Control".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine areas to receive seeding for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected and entire area to be seeded has been received.
- B. Protect structures, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by seeding operations.
- C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 SEEDBED PREPARATION

- A. Limit preparation of seedbed to areas designated for seeding.
- B. Prepare all seedbeds by adequately loosening to a minimum depth of 4 inches by ripping and/or disking. In areas where ripping and/or disking cannot be safely conducted, prepare compacted seedbeds by roughening, either by hand scarifying or by equipment, depending on-site conditions. If seeding is done immediately following construction, seedbed preparation may not be required except on compacted, polished or freshly cut areas. The Engineer will determine condition needs on-site.

3.3 SEEDING, MULCHING, AND WATERING

- A. Sow seed at the rate specified in the seeding tables.
- B. Sow seed with spreader, seeding machine, seed drill, or by hydro-seeding. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
- C. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 3 bales per 1,000 ft² (130 bales per acre). Spread by hand, blower, or other suitable equipment.
- D. Do not seed areas which cannot be mulched in the same day.
- E. Protect seeded, amended, and mulched areas with slopes exceeding 1:6 with coir fiber matting installed and secured according to the Contract Documents.
- F. In areas designated to receive coir fiber matting, apply lime, fertilizer, any other soil amendments, as well as temporary and permanent seed, concurrently before matting is installed.
- G. The Designer may opt to delay or alter seeding in the event of unforeseen natural circumstances.
- H. In the event of unforeseen natural circumstances, particularly drought, it may become necessary for the Contractor to water the temporary and permanent seeding areas to ensure establishment of these species. The Designer will coordinate with all parties involved to determine the most appropriate watering rates and schedule for the area.

3.4 SATISFACTORY SEEDED AREA

- A. Satisfactory Seeded Area: At end of the maintenance period, a healthy, uniform, close stand of herbaceous vegetation has been established, free of undesirable weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches.
- B. Reestablish seeded areas that do not comply with requirements above and continue maintenance until seeded area are satisfactory.

3.5 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by seeding work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, Of other paved areas.
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after seeded area is established.
- C. Remove erosion-control measures after vegetation establishment period.

PART 4 – UNIT PRICES

Unit Prices included on the Bid Form shall include full compensation for all required labor, products, materials, tools, equipment, plant, transportation, services and incidentals; erection, application, or

installation of an item of the Work; operation and maintenance of an item of the Work throughout the life of the Contract; removal of a temporary item of the Work; overhead and profit.

4.1 TEMPORARY SEEDING

- A. Measurement Method: Acre (AC)
- B. Includes: Seedbed preparation; seeding; liming; fertilizing; mulching, watering; all other soil amendments; tacking; watering; maintenance; labor; equipment; tools; and incidentals including, seed, lime, fertilizer, and mulch, and tack necessary to complete work as specified in the Contract Documents.

4.2 PERMANENT SEEDING – ZONE 1 – RIPARIAN UPLAND

- A. Measurement Method: Acre (AC)
- B. Includes: Seedbed preparation; seeding; liming; fertilizing; mulching, watering; all other soil amendments; tacking; watering; maintenance; labor; equipment; tools; and incidentals including, seed, lime, fertilizer, and mulch, and tack necessary to complete work as specified in the Contract Documents.

4.3 PERMANENT SEEDING – ZONE 2 – UPPER STREAM BANK

- A. Measurement Method: Acre (AC)
- B. Includes: Seedbed preparation; seeding; liming; fertilizing; mulching, watering; all other soil amendments; tacking; watering; maintenance; labor; equipment; tools; and incidentals including, seed, lime, fertilizer, and mulch, and tack necessary to complete work as specified in the Contract Documents.

4.4 PERMANENT SEEDING – ZONE 3 – LOWER STREAM BANK TO WATER’S EDGE

- A. Measurement Method: Acre (AC)
- B. Includes: Seedbed preparation; seeding; liming; fertilizing; mulching, watering; all other soil amendments; tacking; watering; maintenance; labor; equipment; tools; and incidentals including, seed, lime, fertilizer, and mulch, and tack necessary to complete work as specified in the Contract Documents.

END OF SECTION 400

SECTION 401 – PLANTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Trees
 - 2. Shrubs
 - 3. Live cuttings

1.3 DEFINITIONS

- A. Bare-Root Stock: Native species exterior plants with healthy buds and a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for kind and size of exterior plant required. Only the highest quality bare root seedlings should be used. Hardwood species planted as bare root seedlings shall have a minimum of 4 first order lateral roots (FOLR) that exceed 1 mm in diameter. Canopy hardwood bare root seedlings shall have a minimum root collar diameter (RCD) of 3/8 inch. For species of bare root seedlings that do not typically exhibit RCD's of 3/8 inch, a minimum RCD of 1/4 inch may be allowed with approval from the Designer. All plant material shall conform to the current issue of the American Standard for Nursery Stock published by the American Association of Nurserymen.
- B. Container Stock: Native species exterior plants grown and marketed in a container with soil or growing medium retained. Specifications for container grown follow the ANSI Z60.1 for kind and use of exterior plant required. Container grown nursery stock shall have a well-established root system reaching the sides of the container to maintain a firm ball but shall not have the excessive root growth encircling the inside of the container.
- C. Finish Grade: Elevation of finished surface of planting soil.
- D. Live cuttings: Locally harvested dormant cuttings from live, healthy, vigorous, well-rooted exterior native species plants as specified in the Contract Drawings.
- E. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- F. Native: Contained within the project site's physiographic providence and within the United States Department of Agriculture's (USDA) Plant Hardiness Zones 8 and 9, west of the Mississippi River.
- G. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- H. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
- I. Subsoil: Subsurface soils found between the 6-inch depth and the interface with parent material such as saprolite or bedrock and should not be used where topsoil is needed.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Certificates: For each type of manufactured product, including soil amendments and fertilizers, signed by product manufacturer, and complying with the following:

1. Manufacturer's certified analysis for standard products.
 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Qualification Data: For landscape installer.
- D. Material Test Reports: For existing surface soil and imported topsoil.
- E. Planting List: Prior to the start of work, the Contractor shall submit a proposed planting list to the Designer for review. No work shall be performed until this schedule is approved by the Designer. The schedule shall indicate the proposed quantity, common and scientific name, and the type (bare root, containerized, etc.) of for each plant species proposed to be planted. The name and location of supplying nursery source for each species shall also be included.
- F. Nursery supply source: The nursery supply source shall certify that the origin of the seeds from which the trees and shrubs were produced from within the USDA's Plant Hardiness Zones 8 and 9, west of the Mississippi River.
- G. Maintenance Instructions: Minimum recommended procedures are defined below in Section 1.9.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants. The planting Contractor shall hold at least one of the following qualifications: Certified Landscape Technician, Certified Plant Professional, Registered Forester, Registered Landscape Contractor, or Certified Nurserymen, unless otherwise approved by the owner. The Owner may consider other ecologists with strong academic credentials (e.g., PhD in Ecology). The installer shall maintain an experienced full-time supervisor onsite when exterior planting is in progress.
- B. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."
- C. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or foots tip-to-tip.
- D. Observation: Designer may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Designer retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs Immediately from Project site.
1. Notify Designer of sources of planting materials seven days in advance of delivery to site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. All plant material shall be stored and handled according Texas A&M Forest Service protocols.
- B. Deliver exterior plants freshly dug.
1. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- C. Do not prune trees and shrubs before delivery, except as approved by Designer. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.
- D. Handle planting stock by root ball.

- E. Deliver exterior plants, including transplants, after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.
 - 1. Heel-in bare-root stock. Soak roots in water for two hours if dried out.
 - 2. Set balled stock and transplants on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 3. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain foot systems in a moist condition.
 - 4. Only the necessary quantities of plant stock will be transported to the site on a daily basis. Large quantities of planting material will not be stored on-site during the planting process unless proper refrigeration is provided by the planting contractor. Refrigerated plant stock will be stored at temperatures between 36 to 40 degrees Fahrenheit in appropriate bags supplied by the plant producer when long-term storage is necessary.
 - 5. It is most desirable for all transplant vegetation will be planted within 1 day of being moved from its original location. If planting in desired location is not feasible, the transplant will be replanted or stored in a manner as to ensure its long-term survival. The designer will provide guidance throughout the process.
- F. Live cuttings shall be submerged and soaked in water for 10 days prior to planting. Cuttings for live cuttings shall be harvested in such a manner that they are cut, immediately put into water to begin the soaking process, and then planted immediately after the 10-day period is completed. Cuttings shall be left wet until the instant that they are planted. Live cuttings are to be loaded, transported, unloaded, installed, and otherwise handled to prevent injury to or drying out of the live cuttings.

1.7 COORDINATION

- A. Planting Restrictions: Plant during the dormant season for San Antonio, TX. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Trees, shrubs, and transplants: Plant during the dormant season for San Antonio, TX (late November – early March) to ensure proper establishment during the following growing season. The Designer may choose to alter or delay this planting schedule in the event of unpredictable natural occurrences (floods, droughts, hurricanes, or other unforeseen circumstances). No planting shall be done when the temperature is below 32 degrees F or above 70 degrees F, when the soil to be excavated for the plant hole is frozen, when the sides or bottom of the plant hole are frozen, or when the soil to be used for backfilling is frozen or too wet.
 - 2. Live cuttings: Staking must take place during the dormant season (late November – early March). Live cuttings may be installed at other times at the direction of the Designer. No planting shall be done when the temperature is below 32 degrees F or above 70 degrees F, or when the soil the live cuttings are to be planted in is frozen
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.
- C. Coordination with seeding: Plant trees and shrubs after finish grades are established and before seeding, unless otherwise acceptable to Designer.
 - 1. When planting trees and shrubs after seeding, protect seeded areas and promptly repair damage caused by planting operations.

1.8 WARRANTY

- A. Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control, including drought, flooding, or excessive temperature.
1. Warranty period for trees and shrubs: One year from date of acceptance of the plantings by the Designer and the Owner.
 2. The contractor shall be responsible for maintaining a survival rate of 80 percent on all permanent plantings for the duration of the warranty period.
 3. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.
 4. Replace exterior plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 5. A limit of one replacement of each exterior plant will be required, except for losses or replacements due to failure to comply with requirements.

1.9 MAINTENANCE

- A. Trees and Shrubs: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings.
1. Maintenance Period: 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

- A. General:
1. Furnish nursery-grown native species trees and shrubs complying with ANSI Z60.1 and with the current issue of the American Standard for Nursery Stock published by the American Association of Nurserymen, with healthy root systems developed by transplanting or root pruning.
 2. Plant materials must be selected from certified nurseries that have been inspected by state and/or federal agencies. Nursery inspection certificates shall be furnished to the Designer upon request.
 3. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 4. All planting stock should be grown by nurseries within the same physiographic province of Texas as the project site and within 200 miles of the project site. The seed sources for all plant material should also match the physiographic province of the area to be planted and genetically improved seedlings should be used when available. In addition, the nursery supply source shall certify that the origin of the seeds from which the trees and shrubs were produced is from USDA's Plant Hardiness Zones 8 and 9, west of the Mississippi River. Plant stock or seed may be obtained from nurseries beyond the 200-mile limit with prior written approval from the Designer. Such approval must be requested and obtained prior to the start of work. Plant material collected from the wild is prohibited, except in the case of transplants and live cuttings.

5. The planting plan was developed using different planting zones as specified on the Construction Drawings. The various species specified identified in the Contract Drawings are to be planted randomly in the appropriate zone. All vegetation designated for a planting zone will be culled for inferior quality before being loaded into planting bags. Furthermore, these species will be thoroughly mixed prior to loading the planting bag, to ensure that each planting zone will be planted in a random manner:
 - a. Trees and shrubs designated for Planting Zone 1 shall be planted on a 30-foot by 30-foot spacing (48 Trees per Acre).
 - b. Trees and shrubs designated for Planting Zones 2 and 3 shall be planted on a 20-foot by 20-foot spacing (194 Trees per Acre).
 - c. Live cuttings designated for use in Planting Zone 3 shall be installed as described in the plan sheet tables and details.
6. Not all the species specified in the Contract Documents may be planted. Commercial availability may dictate which species are planted.
- B. Live cuttings: All live cuttings shall meet the length and diameters outlined on the plan sheet tables. Live cuttings that are diseased or deformed, or are of different dimensions than those described above, or of different species than those listed in the Contract Documents will not be acceptable. Live cuttings shall be installed as shown on the toewood detail, with a minimum of **10 live cuttings per linear foot within each layer**.
- C. Grade: Provide trees and shrubs of sizes and grades complying with ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Designer, with a proportionate increase in size of roots or balls.
- D. Label at least one tree and one shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.
- E. If formal arrangements or consecutive order of trees or shrubs is shown, select stock for uniform height and spread, and number label to assure symmetry in planting.

2.2 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5 to 7, a minimum of 2 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.
 1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Supplement with imported or manufactured topsoil from off-site sources when insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.
 2. Topsoil Source: Import topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.
 3. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites

where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2.3 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.
 - 2. Class: Class O, with a minimum 95 percent passing through No. 8 (2.36mm) sieve and a minimum 55 percent passing through No. 60 (0.25-mm) sieve.
 - 3. Provide lime in form of dolomitic limestone.

2.4 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.5 FERTILIZER

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/ 1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- E. Planting Tablets: Planting tablets shall contain a fertilizer content of 20-10-5. The application rate shall be equivalent to a 10-gram tablet per bare root plant. Any proposed substitution to this nutrient content or planting tablet must be approved by the Designer.

2.6 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood, Ground or shredded bark, Pine straw, Salt hay or threshed straw, Wood and bark chips, Pine needles, Peanut, pecan, and cocoa-bean shells.
- B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1 inch (25-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 1. Organic Matter Content: 50 to 60 percent of dry weight.
 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.7 WEED-CONTROL BARRIERS

- A. Polyethylene Sheeting: ASTM D 4397, black, 0.006-inch- (0.15-mm-) minimum thickness.
- B. Nonwoven Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. (101 g/sq. m) minimum.
- C. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./ sq. yd. (162 g/sq. m).

2.8 STAKES AND GUYS

- A. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated softwood, free of knots, holes, cross grain, and other defects, 2 by 2 inches (50 by 50 mm) by length indicated, pointed at one end.
- B. Guy and Tie Wire: ASTM A 641/A 641M, Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch (2.7 mm) in diameter.
- C. Guy Cable: 5-strand, 3/16-inch- (4.8-mm-) diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches (75 mm) long, with two 3/8-inch (9-mm) galvanized eyebolts.
- D. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch (13 mm) in diameter, black, cut to lengths required to protect tree trunks from damage.
- E. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

2.9 MISCELLANEOUS PRODUCTS

- A. Anti-desiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- B. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4-inch- (100-mm-) wide minimum, with stretch factor of 33 percent.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected. Protect structures, utilities, sidewalks, pavements, other facilities, lawns, and existing exterior plants from damage caused by planting operations. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- B. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain Designer's acceptance of layout before planting. Make minor adjustments as required.

- C. Lay out exterior plants at locations directed by Designer. Stake locations of individual trees and shrubs and outline areas for multiple plantings.
- D. Apply anti-desiccant to trees and shrubs using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
 1. If deciduous trees or shrubs are moved in full leaf, spray with anti-desiccant at nursery before moving and again two weeks after planting.

3.2 TREE AND SHRUB EXCAVATION

- A. Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.
 1. Excavate approximately three times as wide as ball diameter for balled and burlapped, balled and potted, container-grown, and fabric bag-grown stock.
 2. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
- B. Subsoil removed from excavations may be used as backfill, if returned in the order it was removed.
- C. Obstructions: Notify Designer if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
 1. Hardpan Layer: Drill 6-inch- (150-mm) diameter holes into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Designer if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.3 TREE, SHRUB, AND LIVE STAKE PLANTING

- A. Bare root and/or containerized plants shall be installed as directed on the planting plan.
 1. In areas to be planted where the soil is compacted, the soil shall be loosened to a depth of at least one foot.
 2. Bare root plants may be planted in holes made by a mattock, dibble bar, planting bar, or other means that meet the approval of the Designer. The planting trench or hole shall be deep and wide enough to permit roots to spread out and down without J-rooting.
 3. Containerized plants shall be planted according to the plan sheet details and the ANSI Z60.1 standard.
 4. Set and support bare-root stock in center of pit or trench with root collar or trunk flare vertical and flush with adjacent finish grade.
 5. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand.
 6. Puddle with water until backfill layers are completely saturated.
 7. Plumb before backfilling and maintain plumb while working backfill around roots and placing layers above roots.
 8. Tamp final layer of backfill.
 9. Remove injured roots by cutting cleanly; do not break.
 10. Tap roots shall be vertically straight. J-rooted seedlings are unacceptable.
 11. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil.

12. Trees and shrubs may require long-term watering depending on site conditions at the time of establishment. The Contractor will be responsible for maintaining the trees and shrubs using appropriate means and methods to ensure survival.
- B. Install live cuttings through the coir fiber matting within the bankfull channel.
1. The live cuttings shall be installed through the matting approximately 2 feet deep into the ground with no more than 1 foot exposed above the ground. The intent is to install the live cuttings as deep as possible and as close to the water table as possible.
 2. During preparation of the live cuttings, care shall be taken to identify the direction of the terminal or lateral buds. Terminal or lateral buds shall be vertically oriented during the installation of the live cuttings. To ensure this vertical orientation, the Contractor shall cut the basal end of each stake cleanly at a 45-degree angle approximately 24 - 36 inches from the terminal end of the live stake to produce a point. This will allow the Contractor to identify the 'point' of the live stake as the proper end to be installed into the soil substrate. Creating this point at the basal end of each stake will also facilitate easy insertion into the soil. The top or terminal end of each stake shall be cut square to form a flat or blunt end. If each stake is cut as described, the live cuttings shall be planted with the point of the live stake going into the soil and the blunt end facing up, and the terminal or lateral buds will be oriented correctly (upward).
 3. All limbs shall be removed from the sides of each live stake prior to installation.
 4. Following preparation, the live cuttings shall be bundled with twine or rope for transport to the installation or storage area.
 5. In compacted or rocky soils, a pilot hole may be required for each stake. Stakes requiring pilot holes may be driven vertically into the slope with a rubber dead blow hammer with buds oriented in an upward direction.
 6. The area around each live stake shall be compacted by foot after the live stake has been installed.
 7. Any live cuttings that are damaged, split or damaged during installation shall be removed and replaced.
 8. Unless otherwise directed by the Designer, the Contractor shall concentrate the planting of live cuttings at the outside of the meander bends.
- C. Transplant vegetation shall be installed in areas as directed by the Designer.
1. Transplant vegetation will be selected and flagged by the Designer.
 2. Transplant vegetation will be installed at structure-stream bank interfaces and at other potential high stress areas, and at other locations as directed by the Designer.
 3. Soil in the area to receive the transplant shall be loosened to a depth of at least one foot.
 4. All transplants shall be planted to the same depth and orientation as they were originally grown in their natural position.
 5. The planting trench or hole shall be deep and wide enough to permit the roots from the transplant to spread out and down without j-rooting, at least twice the diameter of the transplants root ball or root mass. Topsoil and subsoil shall be kept separate during excavation.
 6. The root ball or root mass for the transplant shall be planted on solid soil and not loose backfill.
 7. The transplant stem shall be planted to remain upright.
 8. Soil shall be replaced around the transplanted vegetation and tamped around the transplant firmly to eliminate air pockets or voids.

9. Immediately after transplanting, the Contractor shall thoroughly water each transplant and replace any soil that is dislodged.
 10. All transplants shall be maintained to ensure vigorous growth and survival.
- D. Organic Mulching: Apply 2-inch average thickness of organic mulch extending 12 inches (300 mm) beyond edge of planting pit or trench. Do not place mulch within 3 inches (75 mm) of trunks or stems.
- E. If not done by nursery, wrap trees of 2-inch (50-mm) caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping.

3.4 TREE AND SHRUB PRUNING

- A. Prune, thin, and shape trees and shrubs as directed by Designer.
- B. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise indicated by Designer, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning.
- C. Prune newly planted vegetation as required to remove dead, broken, and split branches at the direction of the Designer.

3.5 GUYING AND STAKING

- A. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend at least 72 inches (1830 mm) above grade. Set vertical stakes and space to avoid penetrating root balls or root masses. Support trees with two strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree. Use the number of stakes as follows:
 1. Use 2 stakes for trees up to 12 feet (3.6 m) high and 2-1/2 inches (63 mm) or less in caliper; 3 stakes for trees less than 14 feet (4.2 m) high and up to 4 inches (100 mm) in caliper. Space stakes equally around trees.
- B. Guying and Staking: Guy and stake trees exceeding 14 feet (4.2 m) in height and more than 3 inches (75 mm) in caliper, unless otherwise indicated. Securely attach no fewer than 3 guys to stakes 30 inches (760 mm) long, driven to grade.
 1. For trees more than 6 inches (150 mm) in caliper, anchor guys to pressure-preservative-treated deadmen 8 inches (200 mm) in diameter and 48 inches (1200 mm) long buried at least 36 inches (900 mm) below grade. Provide turnbuckles for each guy wire and tighten securely.
 2. Attach flags to each guy wire, 30 inches (760 mm) above finish grade.
 3. Paint turnbuckles with luminescent white paint.

3.6 CLEANUP AND PROTECTION

- A. During exterior planting, keep adjacent work area in an orderly condition.
- B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.
- C. Be careful not to compact areas near plantings with equipment.

3.7 DISPOSAL

- A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off the project property per Yadkin County ordinance.

PART 4 – UNIT PRICES

Unit Prices included on the Bid Form shall include full compensation for all required labor, products, materials, tools, equipment, plant, transportation, services and incidentals; erection, application, or installation of an item of the Work; operation and maintenance of an item of the Work throughout the life of the Contract; removal of a temporary item of the Work; overhead and profit.

4.1 LIVE CUTTING

- A. Measurement Method: Each (EA)
- B. Includes: Providing all plant materials, along with proper storage facilities for all plant materials, planting bed preparation; preparation of subsoil; placing topsoil; liming; mulching; watering; pruning; replacing; and maintaining; all labor; equipment; tools; and incidentals including, plants, lime, fertilizer, all other soil amendments, topsoil, mulch, water, necessary to complete work as specified in the Contract Documents.

4.2 ZONE 1 – RIPARIAN UPLAND

- A. Measurement Method: Each (EA)
- B. Includes: Providing all plant materials, along with proper storage facilities for all plant materials, planting bed preparation; preparation of subsoil; placing topsoil; liming; fertilizing; mulching; watering; pruning; replacing; and maintaining; all labor; equipment; tools; and incidentals including, plants, lime, fertilizer, all other soil amendments, topsoil, mulch, water, necessary to complete work as specified in the Contract Documents.

4.3 ZONE 2 – UPPER STREAM BANK

- A. Measurement Method: Each (EA)
- B. Includes: Providing all plant materials, along with proper storage facilities for all plant materials, planting bed preparation; preparation of subsoil; placing topsoil; liming; fertilizing; mulching; watering; pruning; replacing; and maintaining; all labor; equipment; tools; and incidentals including, plants, lime, fertilizer, all other soil amendments, topsoil, mulch, water, necessary to complete work as specified in the Contract Documents.

4.4 ZONE 3 – LOWER STREAM BANK TO WATER' S EDGE

- A. Measurement Method: Each (EA)
- B. Includes: Providing all plant materials, along with proper storage facilities for all plant materials, planting bed preparation; preparation of subsoil; placing topsoil; liming; fertilizing; mulching; watering; pruning; replacing; and maintaining; all labor; equipment; tools; and incidentals including, plants, lime, fertilizer, all other soil amendments, topsoil, mulch, water, necessary to complete work as specified in the Contract Documents.

END OF SECTION 401

SECTION 500 – IN-STREAM STRUCTURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Toe Wood with Geolift

1.3 DEFINITIONS

- A. Footer(s): A footer is a rock or log that establishes a sound foundation on which to install header(s) in order to complete the construction of the structure.
- B. Header(s): A header is a rock or log that is installed to meet the final grade of the structure. Header(s) sit on top of a footers and are exposed to surface flow.

1.4 SUBMITTALS

- A. Boulders:
 - 1. The contractor shall arrange for the Engineer to observe and approve boulders for in-stream structures at its source prior to delivery to the project site.
 - 2. The Contractor shall obtain from the quarry and submit to the Engineer a certificate verifying the following:
 - a. Rock classification.
 - b. Approximate rock weight per cubic foot.
 - c. Estimated tonnage of rock to be supplied for the project.
- B. Stone Backfill: The contractor shall arrange for the Engineer to observe and approve stone backfill at its source from onsite or prior to delivery to the project site.
- C. Certificate: Mill certificate for geotextile fabric as required in Section 200 “Temporary Erosion and Sedimentation Control.”
- D. Product Certificates: For nails used for fastening geotextile fabric to the log, signed by product manufacturer.
- E. Product Certificates: For number 6 rebar used for pinning logs together, signed by product manufacturer.
- F. Material specification for all stone, both washed and unwashed, including Class A and B stone, and no.5 or no.57 washed stone.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and safely stockpile boulders and stone within the staging and stockpile areas as indicated on the plans. All stockpiles shall be adequately protected with silt fencing as specified in Section 200 “Temporary Erosion and Sediment Control.”
- B. The scheduling of the delivery of materials should be carefully coordinated to ensure that adequate supplies of both are on site at all times such that construction progress is not delayed. The contractor is responsible for making all necessary arrangements with the source of supply in order to insure an adequate supply of materials such that the work will not be unnecessarily delayed due to insufficient supply of such materials on site. The Contractor shall be responsible for disposal of all materials not incorporated into the project as directed by the Engineer. The Contractor shall not be granted an extension of time or extra compensation due to delay caused by

supply, delivery, or provision of, or sampling, testing, approval, or disapproval of materials under the requirements of these specifications.

- C. All materials for in-stream structures shall be safely delivered, stockpiled, stored, and handled such that at no times the stockpiles are unstable or subject to collapse, rolling, or other movement that might pose threat to the safety of those in the vicinity of such stockpiles.
- D. Materials should not be delivered, stockpiled, or otherwise handled when weather or site conditions are such that equipment delivering or handling the materials causes excessive rutting, pumping, erosion or other damage to the soils, site construction entrances, haul roads, or staging and stockpile areas.
- E. Live materials including live cuttings shall be delivered, stored, and handled as specified in Section 401 "Plants."

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing weather conditions permit to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements and surveys: Verify each instream structure type, size, orientation, location, and elevation by field measurements and surveying prior to and during installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Logs: Unless otherwise specified, all logs used as sills, footers, and other instream structure components shall be native hardwood species and shall meet the following requirements:
 - a. The original tree shall have been alive, healthy, and recently harvested from its natural growing position in the ground.
 - b. Minimum diameter of required for the in-stream structure as indicated on the Construction Plans.
 - c. Sufficiently long to allow proper construction in accordance with the appropriate instream structure details and specifications.
 - d. Shall have all branches and limbs pruned to and completely removed from the surface of the log.
 - e. Shall have all of the original bark intact except for that removed during the course of normal harvesting, handling, and installation activities. Shall have the ends cut off square and blunt.
 - f. Rootwads shall be from hardwood trees that are straight, solid, and free of rot, with intact root balls. The diameter of the log shall be no less than 12 in. and not greater than 30 in.; the length of the log shall be no greater than the bankfull width defined for the stream reach in the Contract Documents and no less than 6 ft.
 - g. While most material will come from off-site due to the nature of the existing vegetation, every attempt should be made to use any salvaged trees with the straightest tree trunks and hardest and healthiest wood varieties for the log placements. It is the responsibility of the Contractor to estimate the required number of logs for use in the project site. If a shortage of logs should exist meeting the above requirements, the Contractor should inform the Engineer so that additional logs outside of these above requirements can be approved for use to meet the necessary log quantities. Any logs not meeting these requirements must be approved by the Engineer before installation.
- B. Live cuttings for use in the Toe Wood with Geolift structure shall be dormant branches of species specified in the plans for live cuttings. Live cuttings shall be 1 to 2-1/2 in. in diameter and 5 to 10

ft in length. The harvest date of live cuttings shall be shown on a bill of lading or another approved document. Live cuttings shall be delivered to the project site for onsite storage within 14 days of the harvest date.

- C. Live cuttings as specified in Section 401 “Plants.”
- D. Boulders shall be used for header, footer, sill and anchor rocks for the construction of all instream structures, including offset rock cross vanes, and log vanes.
 - 1. All boulders used for instream structures shall meet the following requirements;
 - a. Shall be angular and flat in shape with one axis approximately 2 to 3 times longer than the smallest axis in order to resist rolling
 - b. Shall be of an appropriate natural color (e.g. green/gray, brown/gray, dark gray, and/or dark brown in color). White rock is not acceptable.
 - c. Shall be sound, tough, dense and free from laminations, weak cleavages, and shall not disintegrate from the action of air, water, salt water, or from handling and placing. Granular sedimentary rock shall generally be unacceptable.
 - d. Shall have a minimum unit weight of 160 lbs. per cubic foot.
 - e. Boulders shall be of the minimum size indicated on the Construction Plans.
 - 2. Boulders shall be obtained from an approved source and shall not be harvested from streams or rivers outside a commercial quarry operation.
 - 3. Concrete shall not be considered as an alternative for boulders, except in the cases where the Engineer specifically approves the used of concrete debris encountered on site for use in lieu of footer rock.
 - 4. The supply of boulders removed from the project site as specified in Section 302 “Earth Moving,” that meet the proper specifications as outlined here, shall be exhausted for the construction of instream structures prior to using such rock from an off-site source. Once this requirement is satisfied, specified rock obtained from off site may be utilized as required to supplement that obtained on site for the purposes of constructing instream structures.
- E. Stone backfill shall consist of an equal mixture by volume of No. 4 or No. 5 washed stone per 2014 TXDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, Item 421, Table 4 – Coarse Aggregate Gradation Chart; and 12 in riprap per 2014 TXDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, Item 432, Table 2 – Protection Riprap Stone Sizes.
 - a. The supply of stone that meets the proper specifications as outlined here, shall be exhausted for the construction of instream structures prior to using such rock from an off-site source. Once this requirement is satisfied, specified rock obtained from off site may be utilized as required to supplement that obtained on site for the purposes of constructing instream structures.
- F. Riffle bed material shall consist of a well graded equal mixture by volume of No. 4 washed stone per 2014 TXDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, Item 421, and 12 in riprap per 2014 TXDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, Item 432, Table 2 – Protection Riprap Stone Sizes.
 - a. The supply of stone that meets the proper specifications as outlined here, shall be exhausted for the construction of instream structures prior to using such rock from an off-site source. Once this requirement is satisfied, specified rock obtained from off site may be utilized as required to supplement that obtained on site for the purposes of constructing instream structures.

- G. Geotextile Fabric shall meet the requirements in Section 200 “Temporary Erosion and Sediment Control.”
- H. Coir Fiber Matting and wood stakes shall meet the requirements in Section 200 “Temporary Erosion and Sediment Control.”
- I. Nails used for fastening the geotextile fabric to the log sills shall be plastic cap galvanized or aluminum roofing nails of sufficient length to securely fasten the fabric to the logs.
- J. Rebar used for pinning logs together for log structures shall be uncoated steel number 6 rebar.

PART 3 – EXECUTION

3.1 PREPARATION

- A. The Contractor shall:
 1. Verify the suitability of substrates where the instream structures are to be installed.
 2. Verify with the Engineer that the instream structures are at the location and grade indicated on the plans and profile.
- B. The Contractor shall verify that all materials, including rock, logs, geotextile fabric, coir fiber matting and stakes, temporary and permanent seed, all specified soil amendments, and mulching and tacking materials, are on site prior to beginning the construction of any instream structures.

3.2 INSTALLATION

The Contractor shall use an excavator with a hydraulic thumb for the installation of the instream structures. The excavator and all appurtenances shall be of sufficient size and condition to perform the work.

In-stream structures shall be constructed to within 0.2 feet of the dimensions, elevations, angles, and locations in accordance with the Construction Plans and the appropriate instream structure details, structure table, and specifications unless otherwise directed by the Engineer.

- A. Toe Wood with Geolift shall be used for streambank protection and instream habitat
 1. Toe wood must be installed along the bank in a trench dug to the depth and width specified in the structure tables. If toe wood is being placed in a location where there is no existing ground, place fill material and compact to form the trench for the toe wood materials.
 2. Excavate a trench slightly larger than the outside dimensions of the structure shown on the Contract Documents. A layer of foundation logs should be placed below the finished pool elevation. Foundation logs shall be placed roughly every 6ft along the bank, angled 20 to 30 degrees tangent to the top of bank pointed downstream.
 3. Install a rootwad every 6 ft longitudinally on top of the foundation logs. Install layers of brush material in a crisscross pattern on top of the row of rootwads. Place an unconsolidated layer of salvaged subsoil on top of the brush layer to meet the elevations specified in the Structure Tables.
 4. Cover the layer of salvaged subsoil with matting and install live cuttings through the matting to make contact with the salvaged subsoil and baseflow. Install live cuttings through the top layer of matting, at a minimum density of 10 cuttings per linear foot
 5. To install live cuttings, use a rebar stake or other approved method to make a pilot hole near horizontal, through the matting and into the salvaged subsoil. Orient buds of each live branch cutting upwards and insert into pilot hole. Gently tamp the live branch cutting into the soil with a hammer and wood block, dead blow hammer or with a rubber mallet, so that at least 2/3 of the live branch cutting is installed below the salvaged subsoil level, and at least two

buds are above the soil surface and extending out into the stream channel. Replace any live cuttings that are split or severely damaged during installation.

6. Place another layer of soil stabilization matting over top of the live cuttings and place first lift of salvaged topsoil over the matting, leaving sufficient overlap on the matting to completely wrap the soil lift. Compact soil lifts using the excavator bucket. Seed and wrap compacted soil lift with soil stabilization matting and anchor with Wood Matting Stakes to hold the matting in place. Construct multiple soil lifts as needed to achieve the bankfull elevation specified in the vertical profile.
7. Install live cuttings through the top layer of matting, at a minimum density of 10 cuttings per linear foot.

3.3 FIELD QUALITY CONTROL

- A. The Contractor and Engineer shall observe all instream structures during normal stream flow conditions. The Contractor shall adjust rock, log vanes, toe wood, or any other items as directed by the Engineer before such structures will be considered completed.
- B. All instream structures shall be constructed to the following tolerances:
 1. Maximum variation from plans and profile:
 - a. 0.2 feet horizontal
 - b. 0.2 feet vertical

3.4 CLEANING

- A. Upon completion of work, reshape slopes and stream bottom to specified elevations.
- B. Remove and dispose of all unsuitable and surplus rock, and excavated material as directed by the Engineer.

PART 4 – UNIT PRICES

Unit Prices included on the Bid Form shall include full compensation for all required labor, products, materials, tools, equipment, plant, transportation, services and incidentals; erection, application, or installation of an item of the Work; operation and maintenance of an item of the Work throughout the life of the Contract; removal of a temporary item of the Work; overhead and profit.

4.1 TOE WOOD WITH GEOLIFT

- A. Measurement Method: Linear Foot (LF)
- B. Includes: Excavation; backfill; logs and rootwads installation and adjustment to Designer instruction; installation of non-woven geotextile fabric, brush material, live cutting, and geolift and adjustment to Designer instruction; disposal of any materials not incorporated into the project as directed by the Designer; supply, transport, storage, and re-handling of all materials and incidentals, including non-woven geotextile fabric, stone backfill, and all labor, equipment, tools as necessary to complete the work as specified in the Contract Documents.

END OF SECTION 500