



Frisco Bay Marina Site and Landscape Improvements

277 Marina Road, Frisco, Colorado

Project Manual

19 September 2022



SECTION 00 0102
PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

- A. The Owner of the Project, hereinafter referred to as Owner: Town of Frisco.
 - 1. Sales Tax Exemption Number: to be provided by Owner.
- B. Owner's Project Manager: Mr. Addison Canino
 - 1. Department: Town of Frisco Public Works
 - 2. Address: P.O. Box 4100
 - 3. City, State, Zip: Frisco, CO 80443
 - 4. Phone: 970-331-6632
 - 5. E-mail: AddisonC@townoffrisco.com

1.02 NOTICE TO PROSPECTIVE BIDDERS

- A. These documents constitute an Invitation to Bid to and request for qualifications from General Contractors for the construction of the project described below.

1.03 PROJECT DESCRIPTION

- A. Summary Project Description:
 - 1. The project scope includes new site and landscape areas, with associated grading, drainage and utility work, as noted on plans.
- B. Contract Terms: Cost plus a fee, with a guaranteed maximum price (GMP).

1.04 PROJECT CONSULTANTS

- A. The Architect, hereinafter referred to as Architect: Stais Architecture & Interiors.
 - 1. Address: 409 East Main Street, suite 107.
 - 2. City, State, Zip: Frisco, CO 80443.
 - 3. Phone/Fax: 970-453-0444.
 - 4. E-mail: matt@staisarchitects.com.
 - 5. Other Design Consultants: as noted on Cover Sheet of the drawings.

1.05 TIMETABLE

- A. As established by Owner in RFP Documents.

1.06 PROCUREMENT DOCUMENTS

- A. Documents may be viewed at online locations as specified by the Owner in RFP documents.

1.07 BID SECURITY

- 1. Bids shall be accompanied by a security deposit as specified by the Owner in RFP documents (bid form).

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

**SECTION 00 0110
TABLE OF CONTENTS**

PROCUREMENT AND CONTRACTING REQUIREMENTS

1.01 DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

- A. 00 0102 - Project Information
- B. 00 0110 - Table of Contents
- C. 00 0115 - List of Drawing Sheets
- D. 00 2113 - Instructions to Bidders
- E. 00 3110 - Available Project Information

SPECIFICATIONS

2.01 DIVISION 01 -- GENERAL REQUIREMENTS

- A. 01 2000 - Price and Payment Procedures
- B. 01 2300 – Bid Alternates
- C. 01 2500 - Substitution Procedures
- D. 01 3000 - Administrative Requirements
- E. 01 3400 - Shop Drawings, Product Data and Samples
- F. 01 3553 - Security Procedures
- G. 01 4000 - Quality Requirements
- H. 01 4216 - Definitions
- I. 01 4218 - Abbreviations
- J. 01 4219 - Reference Standards
- K. 01 5000 - Temporary Facilities and Controls
- L. 01 5100 - Temporary Utilities
- M. 01 5500 - Vehicular Access and Parking
- N. 01 5813 - Temporary Project Signage
- O. 01 6000 - Product Requirements
- P. 01 7000 - Execution and Closeout Requirements
- Q. 01 7419 - Construction Waste Management and Disposal
- R. 01 7800 - Closeout Submittals
- S. 01 7900 - Demonstration and Training

2.02 DIVISION 02 -- EXISTING CONDITIONS

- A. For Site Preparation and Earthwork, see Division 31
- B. For Pile and Other Foundations, see Division 31
- C. For Pavements and Site Improvements, see Division 32
- D. For Site Utilities, see Division 33
- E. 02 3000 - Subsurface Investigation
- F. 02 4100 - Demolition

2.10 DIVISION 26 -- ELECTRICAL

- A. 26 0519 - Low-Voltage Electrical Power Conductors and Cables

211 DIVISION 31 -- EARTHWORK

- A. 31 0513 - Soils for Earthwork
- B. 31 0516 - Aggregates for Earthwork
- C. 31 1000 - Site Clearing
- D. 31 2213 - Rough Grading
- E. 31 2316 - Excavation
- F. 31 2318 - Rock Removal
- G. 31 2319 - Dewatering
- H. 31 2323 - Fill
- I. 31 3700 - Riprap

212 DIVISION 32 -- EXTERIOR IMPROVEMENTS

- A. 32 1123 - Aggregate Base Course
- B. 32 1610 – Concrete Curb, Gutter and Sidewalk
- C. 32 1313 - Concrete Paving
- D. 32 1812 – Crusher Fine Paving
- E. 32 9000 - General Landscape
- F. 32 9010 - Landscape Maintenance
- G. 32 9113 - High Altitude Soil Preparation
- H. 32 9219 - Seeding
- I. 32 9223 - Sodding

213 DIVISION 33 -- UTILITIES

- A. 33 4110 – Storm Utility Drainage Piping
- B. 33 4924 - Bioretention Pond

END OF SECTION

**SECTION 00 0115
LIST OF DRAWINGS**

CS	COVER SHEET
C001	CIVIL NOTES AND LEGEND
C002	CIVIL ABBREVIATIONS
C101	CIVIL EXISTING CONDITIONS AND TESC PLAN
C102	CIVIL SITE PLAN
C103	CIVIL GRADING PLAN
C104	POND GRADING AND STORM DRAIN PROFILE
C501	CIVIL SITE DETAILS
L-001	LANDSCAPE NOTES
L-002	LANDSCAPE SCHEDULES
L-003	LANDSCAPE SCHEDULES
L-004	OVERALL PLAN
L-101	LANDSCAPE PLAN
L-401	PLANTING ENLARGEMENTS
L-402	PLANTING ENLARGEMENTS
L-501	LANDSCAPE DETAILS
LS-101	HARDSCAPE PLAN
LS-501	HARDSCAPE DETAILS
LS-502	HARDSCAPE DETAILS
LI-001	IRRIGATION NOTES
LI-101	IRRIGATION PLAN
LI-501	IRRIGATION DETAILS
LI-502	IRRIGATION DETAILS
LI-503	IRRIGATION DETAILS

END OF SECTION

SECTION 00 2113
INSTRUCTIONS TO BIDDERS

SUMMARY

1.01 THE INSTRUCTIONS IN THIS DOCUMENT AMEND OR SUPPLEMENT THE INSTRUCTIONS TO BIDDERS AND OTHER PROVISIONS OF THE BIDDING AND CONTRACT DOCUMENTS.

INVITATION

2.01 BID SUBMISSION

- A. Bids signed, executed and dated will be received by the Owner as noted in RFP documents.
- B. Offers submitted after the above time shall be returned to the bidder unopened.
- C. Amendments to the submitted offer will be permitted if received in writing prior to bid closing and if endorsed by the same party or parties who signed and sealed the offer.

2.02 CONTRACT TIME

- A. Identify Contract Time in the Bid Form. The completion date in the Agreement shall be the Contract Time added to the commencement date.

3.01 CONTRACT DOCUMENTS IDENTIFICATION

- A. Contract Documents are identified as Project Number 2161, as prepared by Architect, and with contents as identified in the Table of Contents.

3.02 AVAILABILITY

- A. Bid Documents may be obtained online at the website of the Owner.

3.03 INQUIRIES/ADDENDA

- A. Direct questions to Owner, via email: AddisonC@townoffrisco.com.
- B. Addenda may be issued during the bidding period. All Addenda become part of Contract Documents. Include resultant costs in the Bid Amount.
- C. Verbal answers are not binding on any party.
- D. Clarifications requested by bidders must be in writing as outlined in RFP documents. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients.

3.04 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

- A. Substitute products will be considered if submitted as an attachment to the Bid Form. Approval to submit substitutions prior to submission of bids is not required.
- B. In submission of substitutions to products specified, bidders shall include in their bid all changes required in the work and changes to Contract Time and Contract Sum to accommodate such substitutions. A later claim by the bidder for an addition to the Contract Time or Contract Sum because of changes in work necessitated by use of substitutions shall not be considered.
- C. The submission shall provide sufficient information to determine acceptability of such products.
- D. Provide complete information on required revisions to other work to accommodate each proposed substitution.
- E. Provide products as specified unless substitutions are submitted in this manner and accepted.

4.01 DURATION OF OFFER

- A. Bids shall remain open to acceptance and shall be irrevocable for a period of sixty (60) days after the bid closing date.

4.02 ACCEPTANCE OF OFFER

- A. Owner reserves the right to accept or reject any or all offers.
- B. After acceptance by Owner, Architect on behalf of Owner, will issue to the successful bidder, a written Bid Acceptance.

END OF SECTION

SECTION 00 3110
AVAILABLE PROJECT INFORMATION

USING THE PROJECT MANUAL

THE INFORMATION CONTAINED IN THIS PROJECT MANUAL HAS BEEN ORGANIZED UTILIZING MASTERFORMAT, A PUBLICATION JOINTLY PRODUCED BY THE CONSTRUCTIONS SPECIFICATIONS INSTITUTE (CSI) AND CONSTRUCTION SPECIFICATIONS CANADA (CSC).

THE PROJECT MANUAL CONSISTS OF FOUR MAJOR PARTS:

- Bidding Requirements
- Contract Forms
- Conditions of the Contract
- Drawings and Specifications

SPECIFICATIONS HAVE BEEN DIVIDED INTO 33 DIVISIONS. NOTE THAT NOT ALL DIVISIONS ARE NECESSARILY USED. THE DIVISIONS ARE FURTHER DIVIDED INTO SECTIONS OF WORK.

WORK AND REQUIREMENTS ARE SPECIFIED IN PARTICULAR DIVISIONS AND SECTIONS ACCORDING TO THE TYPE OF WORK OR PRODUCT TO BE FURNISHED AND NOT ACCORDING TO TRADE JURISDICTION NOR LOCAL PRACTICES.

SPECIFICATIONS ARE WRITTEN IN IMPERATIVE AND ABBREVIATED FORM. THIS IMPERATIVE LANGUAGE OF THE TECHNICAL SECTIONS IS DIRECTED AT THE CONTRACTOR, UNLESS SPECIFICALLY NOTED OTHERWISE. INCOMPLETE SENTENCES SHALL BE COMPLETED BY INSERTING "SHALL", "THE CONTRACTOR SHALL", AND "SHALL BE", AND SIMILAR MANDATORY PHRASES BY INFERENCE IN THE SAME MANNER AS THEY ARE APPLIED TO NOTES ON THE DRAWINGS. THE WORDS "SHALL BE" SHALL BE SUPPLIED IN INFERENCE WHERE A COLON (:) IS USED WITHIN SENTENCES OR PHRASES. EXCEPT AS WORDED TO THE CONTRARY, FULFILL (PERFORM) ALL INDICATED REQUIREMENTS WHETHER STATED IMPERATIVELY OR OTHERWISE.

NOTICE TO BIDDERS

The following information regarding site survey and subsurface conditions was obtained or otherwise acquired by the Owner for his use. It is presented here to aid the Bidder in the preparation of his bid.

Neither the Owner nor the Architect warrant the accuracy of this information, which has been furnished or prepared by other parties. Bidders should verify this information prior to submitting their bid.

SITE SURVEY

A topographical survey of the existing site has been provided by Schmidt Land Surveying, Inc, PO Box 5761, Frisco, CO 80443 (970-409-9963). The Owner and the Architect make no warranty or representation with reference to the accuracy and completeness of the existing conditions indicated or not indicated on the survey. Bidders shall submit all questions about the survey to the Architect, in writing.

SUBSURFACE INVESTIGATION

A geotechnical report specific to this site is not available at this time. Further information regarding geotechnical conditions in the local area may be available from the Owner.

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of the General Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

- A. Section 01 6000 - Product Requirements.

1.03 SCHEDULE OF VALUES

- A. Forms filled out by hand will not be accepted.
- B. Submit an electronic copy of AIA Form G703 - Application and Certificate for Payment and/or Continuation Sheet. Contractor's standard form or electronic media printout will be considered.
- C. Submit Schedule of Values in duplicate within 30 days after date of Owner-Contractor Agreement or as established in Notice to Proceed.
- D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
- E. Include separately from each line item, a direct proportional amount of the General Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders, with each Application for Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: monthly.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Owner and Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Present required information in typewritten form.
- E. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets when required.
- F. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.

8. Percentage of Completion.
 9. Balance to Finish.
 10. Retainage.
- G. Execute certification by signature of authorized officer.
 - H. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
 - I. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
 - J. Submit one copy of each Application for Payment.

1.05 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to the General Contractor.
- B. Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on AIA Form G710.
- C. Change Order: Architect may issue a document, signed by Owner, instructing the General Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change.
- D. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. the General Contractor shall prepare and submit a fixed price quotation within ten days.
- E. The General Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 6000.
- F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on the General Contractor's price quotation.
 2. For change requested by the General Contractor, the amount will be based on the General Contractor's request for a Change Order as approved by Architect.
 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 4. For change ordered by Owner without a quotation from the General Contractor, the amount will be determined by Owner based on the General Contractor's substantiation of costs as specified for Time and Material work.
- G. Substantiation of Costs: Provide full information required for evaluation.
 1. On request, provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- K. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 1. All closeout procedures specified in Section 01 7800.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 2300
BID ALTERNATES**

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

To enable the owner to compare total costs where alternate materials and methods might be used, bid alternates have been established as described herein. The general contractor shall be responsible for cost analysis of base bids and alternates for owner review.

If the owner elects to proceed on the basis of one or more bid alternates, the general contractor shall make all modifications to the work required in order to furnish and install the selected alternate or alternates to the approval of the owner and architect and at no additional cost to the owner other than as proposed on the bid form.

Immediately after the owner has made decisions on which alternates to include in the work, the general contractor shall thoroughly and clearly advise all necessary personnel and suppliers as to the nature and extent of selected alternates.

1.02 RELATED REQUIREMENTS

- A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.

1.03 BID ALTERNATES

Provide change in contract sum for the following alternates as described below:

- A. ALTERNATE #1 – REPAIR OF EXISTING DRYWELL:
PROVIDE CHANGE IN CONTRACT SUM TO REPAIR EXISTING DRYWELL, INSTALL FRENCH DRAIN AND CONNECTING STORM PIPE AS SHOWN AND NOTED ON CIVIL ENGINEERING DOCUMENTS.
- B. ALTERNATE #2 – RECONSTRUCTION OF EMERGENCY ACCESS ROAD (fire lane to pier):
PROVIDE CHANGE IN CONTRACT SUM TO REMOVE, STOCKPILE AND REINSTALL EXISTING CLASS 6 AGGREGATE BASE COURSE AT EMERGENCY ACCESS ROAD, AS SHOWN AND NOTED ON CIVIL ENGINEERING DOCUMENTS.
- C. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- D. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

201 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- B. A Substitution Request for specified installer constitutes a representation that the submitter:
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Note explicitly any non-compliant characteristics.
- D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. No specific form is required. the General Contractor's Substitution Request documentation must include the following:
 - a. Project Information:
 - 1) Official project name and number, and any additional required identifiers established in Contract Documents.
 - 2) Owner's, Architect's, and the General Contractor's names.
 - b. Substitution Request Information:
 - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
 - 2) Indication of whether the substitution is for cause or convenience.
 - 3) Issue date.
 - 4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 5) Description of Substitution.
 - 6) Reason why the specified item cannot be provided.
 - 7) Differences between proposed substitution and specified item.
 - 8) Description of how proposed substitution affects other parts of work.
 - c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
 - d. Impact of Substitution:
 - 1) Savings to Owner for accepting substitution.
 - 2) Change to Contract Time due to accepting substitution.
- E. Limit each request to a single proposed substitution item.

202 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify the General Contractor in writing of decision to accept or reject request.

203 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Electronic document submittal service.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Progress photographs.
- F. Submittals for review, information, and project closeout.
- G. Requests for Interpretation (RFI) procedures.
- H. Submittal procedures.

1.02 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Owner and/or Architect:
 - 1. Requests for Interpretation (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Manufacturer's instructions and field reports.
 - 6. Applications for payment and change order requests.
 - 7. Progress schedules.
 - 8. Coordination drawings.
 - 9. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 10. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 - 1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, the General Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 - 2. the General Contractor and Architect are required to use this service.
 - 3. It is the General Contractor's responsibility to submit documents in allowable format.
 - 4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
 - 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 - 6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.

7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Cost: The cost of the service is to be paid by the General Contractor; include the cost of the service in the Contract Sum.
- C. Submittal Service: The selected service is: TBD by General Contractor, subject to the approval of Owner and Architect.
- D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and the General Contractor participating; further training is the responsibility of the user of the service.
- E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-weekly intervals.
- B. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Contractor, Architect, as appropriate to agenda topics for each meeting.
- D. Record minutes and distribute copies within five days after meeting to participants, with copies to Architect, Owner, the owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 5 days after date of the Agreement, submit preliminary schedule defining planned operations for the Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 2 days.
- C. Within 5 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 2 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.04 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.

3.05 REQUESTS FOR INTERPRETATION (RFI)

- A. Definition: A request seeking one of the following:
 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 1. Prepare a separate RFI for each specific item.
 2. Prepare in a format and with content acceptable to Owner.
 3. Prepare using software provided by the Electronic Document Submittal Service.

4. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 1. Include in each request the General Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 2. Owner's, Architect's, and the General Contractor's names.
 3. Discrete and consecutive RFI number, and descriptive subject/title.
 4. Issue date and requested reply date.
 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 7. the General Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
 1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 2. Note dates of when each request is made, and when a response is received.
 3. Highlight items requiring priority or expedited response.
 4. Highlight items for which a timely response has not been received to date.
 5. Identify and include improper or frivolous RFIs.
- H. Review Time: Architect will respond and return RFIs to the General Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in the General Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
 1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
 2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
 3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.

4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.06 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data - See Section 013400 for submittal requirements.
 2. Shop drawings - See Section 013400 for submittal requirements.
 3. Samples for selection - See Section 013400 for submittal requirements.
 4. Samples for verification.
- B. Submit to Architect for review per Section 013400.

3.07 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions - See Section 013400: Shop Drawings, Product Data, and Samples for submittal requirements.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.08 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
 1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.
 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.09 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 1. After review, produce duplicates.
 2. Retained samples will not be returned to the General Contractor unless specifically so stated.

3.10 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
 1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D. Architect's and consultants' actions on items submitted for review:
 1. Authorizing purchasing, fabrication, delivery, and installation:

- a. "Approved", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At the General Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 - 1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
 - 2) Non-responsive resubmittals may be rejected.
 - 2. Not Authorizing fabrication, delivery, and installation:
 - a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.
 - 2) Non-responsive resubmittals may be rejected.
 - b. "Rejected".
 - 1) Submit item complying with requirements of Contract Documents.
- E. Architect's and consultants' actions on items submitted for information:
- 1. Items for which no action was taken:
 - a. "Received" - to notify the General Contractor that the submittal has been received for record only.
 - 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from the General Contractor.

END OF SECTION

SECTION 01 3400
SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 GENERAL

1.01 SHOP DRAWINGS

A. General:

1. Provide newly prepared information. Contract Documents and standard information reproduced or copied for use as Shop Drawings will be rejected.
2. Mechanical and Electrical Shop Drawings: Provide electronic copies in PDF format of manufacturer's literature and drawings, unless specified otherwise in Mechanical and Electrical specifications sections.
3. All Other Shop Drawings: Provide electronic copies in PDF format.
4. Sheet Size (when printed): Not smaller than 8-1/2 X 11" or larger than 24x36", in multiples of 8-1/2 X 11".
5. Present in clear and thorough manner.
6. Title each drawing with Project Name, subcontractor and date.
7. Identify each drawing element by reference to sheet number and detail, schedule, or room number of Contract Documents.
8. Identify field dimensions; show relation to adjacent or critical features or Work or products.

1.02 SUBMISSION REQUIREMENTS

A. General:

1. The General Contractor is to review, upon receipt, for completion of submittals in accordance with this section. The General Contractor is to perform their review process, as indicated below, prior to submitting to the Architect and/or Engineer.
2. The General Contractor is to submit to project team via email or upload to project management software platform. Deliver in sequence and time to avoid delay in Work or work of other contracts.
3. Transmit complete submittals required by Mechanical and Electrical Specification Divisions at one time; partial or incomplete submittals will be rejected.
4. Coordinate submittals into logical groupings to facilitate interrelation of the several items.
5. Finishes which involve Owner/Architect/Engineer selection of colors, textures, or patterns.

B. Architect/Engineer Duties:

1. Review submittals with reasonable promptness.
2. Affix stamp and initials or signature, and indicate resubmittal requirements or approval of submittal.
3. Return submittals to Contractor for distribution, or for resubmission.

C. General Contractor Duties:

1. Review submittals before submission; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers and similar data, and conformance of submittal with requirements of Contract Documents.
2. Coordinate submittals with requirements of Work and Contract Documents.
3. Sign or initial each sheet of shop drawings and product data, and each sample label to certify compliance with requirements of Contract Documents. Notify Architect/Engineer, in writing at time of submittal, of all deviations from requirements of Contract Documents.

1.03 RESUBMISSION REQUIREMENTS

- A. Make corrections or changes required by Architect/Engineer and resubmit until approved.
- B. Shop Drawings and Product Data: Revise initial drawings or data and resubmit as specified for initial submittal; indicate changes which have been made other than those requested by Architect/Engineer.
- C. Samples: Submit new samples as required for initial submittal.

1.04 DISTRIBUTION

- A. Distribute reproductions of shop drawings and copies of product data which carry Architect/Engineer stamp of approval to job site and record documents file, other affected contractors, subcontractors, and suppliers, fabricators, and other entities requiring information.
- B. Distribute samples with Architect/Engineer stamp of approval as directed by Architect/Engineer.
- C. Provide electronic copies of complete project archive upon project completion to Owner and Architect, via permanent storage device (external hard drive, USB drive, or approved equal).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 3553
SECURITY MEASURES**

PART 1 GENERAL

1.01 SECURITY PROGRAM

- A. Protect Work, existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
- B. Maintain program throughout construction period until Owner occupancy.

1.02 ENTRY CONTROL

- A. Coordinate with Owner's operations team to restrict entrance of persons and vehicles into Project site.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Testing Agency Qualifications:
1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- C. Test Reports: After each test/inspection, promptly submit electronic copies of report to Architect.
1. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and the General Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit report in duplicate within 30 days of observation to Architect for information.
 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
- G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.02 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.
- D. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.
- E. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- F. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- G. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- H. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
- I. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
- J. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Owner, it is not practical to remove and replace the work, Owner will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4216

DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

- A. Furnish: To supply, deliver, unload, and inspect for damage.
- B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- D. Provide: To furnish and install.
- E. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4218
ABBREVIATIONS

PART ONE - GENERAL

1.01 RELATED INFORMATION

- A. Refer to various Sections of Project Manual - Abbreviations and Definitions may also be found applicable to that Section.
- B. Additional abbreviations defined or undefined may be found in the Contract Documents. Request clarification if in doubt as to meaning.

1.02 LIST OF ABBREVIATIONS

A/E	Architect/Engineer
AASHTO	American Association of State Highway & Transportation Officials
AB	Anchor bolt
ABAN	Abandon
ABC	Aggregate base course
AC	Air conditioning
AC PNL	Acoustical panel
ACT	Acoustical tile
ACI	American Concrete Institute
ACP	Asphaltic concrete paving
ACU	Acoustical
ACWT	Acoustical wall treatment
AD	Area drain
ADC	Automatic door closer
ADDL	Additional
ADD	Addendum
ADH	Adhesive
ADJ	Adjustable
ADJ	Adjacent
ADS	Automatic door seal
AF	Access floor
AFF	Above finish floor
AFG	Above finish grade
AFS	Above finish slab
AGA	American Gas Association
AGG	Aggregate
AHU	Air handling unit
AIA	American Institute of Architects
AL	Aluminum
ALT	Alternate
ANOD	Anodized
ANSI	American National Standards Institute
AP	Access panel

APPROX	Approximate
ARCH	Architectural
ASC	Above suspended ceiling
ASHRAE	American Society of Heating Refrigeration and Air Conditioning
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineers
ASSY	Assembly
ASTM	American Society of Testing and Materials
AUTO	Automatic
AUX	Auxiliary
AVE	Avenue
AVG	Average
AWI	American Woodwork Institute
AWWA	American Water Works Association

B/	Bottom of
B&B	Balled and burlapped
BB	Bulletin board
BD	Board
BTWN	Between
BEV	Beveled
B/FTG	Bottom of footing
BITUM	Bituminous
BLDG	Building
BLK	Block
BLKG	Blocking
BLKHD	Bulkhead
BM	Beam
BMK	Benchmark
BOF	Bottom of footing
BOR LT	Borrowed light
BOT	Bottom
BOW	Bottom of wall
BR	Bear
BRCG	Bracing
BRG	Bearing
BRK	Brick
BRKT	Bracket
BS	Bullshit
BSMT	Basement
BT	Bolt

B/FTG	Bottom of footing
C	Centigrade
C&G	Curb and gutter
C/C	Center to center
CAB	Cabinet
CB	Catch Basin
CDOT	Colorado Department of Transportation
CEM	Cement
CFM	Cubic feet per minute
CG	Corner guard
CI	Cast iron
CISPI	Cast Iron Soil Pipe Institute
CJ	Control joint
CL	Centerline
CLG	Ceiling
CL	Closet
CLR	Clear
CMP	Corrugated metal pipe
CMU	Concrete masonry unit
CNR	Counter
COL	Column
COMM	Communication
CONC	Concrete
CONF	Conference
CONN	Connection
CONST	Construction
CONT	Continuous
CONTR	Contractor
COORD	Coordinate
CORR	Corridor
CS	Commercial standard
CSB	Concrete splash block
CSI	Construction Specifications Institute
CSMT	Casement
CT	Ceramic tile
CTR	Center
CU	Cubic
D or d	Penny (nail)
DBL	Double
DCL	Door closer

DEG	Degree
DEPT	Department
DET	Detail
DF	Drinking fountain
DIAG	Diagonal
DIAM	Diameter
DIM	Dimension
DL	Dead load
DM	Demountable partition
DN	Down
DO	Ditto
DOW	Department of Wildlife
DR	Door
DS	Downspout
DT	Drain tile
DVTL	Dovetail
DW	Dishwasher
DWG	Drawing
DWR	Drawer
DWTR	Dumbwaiter
E	East
EA	Each
EF	Each face
EIFS	Exterior insulation and finish system
EL	Elevation
ELEC	Electric/electrical
ELEV	Elevator
EMER	Emergency
ENCL	Enclosure
ENG	Engineer, engineering
ENT	Entrance
EQ	Equal
EQP	Equipment
EQV	Equivalent
ESC	Escalator
ESMT	Easement
EST	Establish
EW	Each way
EWC	Electric water cooler
EXC	Excavation
EXH	Exhaust

EXP	Exposed
EXP	Expansion
EX	Existing
EXT	Exterior
F	Fahrenheit
F/	Face of
FA	Fire alarm
FAB	Fabricate
FD	Floor drain
FDN	Foundation
FE	Fire extinguisher
FEC	Fire extinguisher cabinet
FF	Finish face
FG	Fiberglass
FHC	Fire hose cabinet
FHP	Full height partition
FIN	Finish
FL, FLUOR	Fluorescent
FLR	Floor
FLEX	Flexible
FLG	Flashing
FLR	Floor
FP	Fireplace
FPRFG	Fireproofing
FR	Fire rated
FS	Full size
FSTNR	Fastener
FT	Foot/feet
FTG	Footing
FURN	Furniture
FURR	Furring
FWC	Fabric Wall Covering
FXT	Fixture
GA	Gage
GALV	Galvanized
GB	Grab bar
GC	General contractor
GI	Galvanized Iron
GL	Glass
GLZ	Glazing

GR	Grade/grading
GRL	Grille
GWB	Gypsum wallboard
GYP	Gypsum
HB	Hose bibb
HC	Hollow Core
HD	Head
HDWR	Hardware
HEX	Hexagonal
HT	Height
HM	Hollow metal
HORIZ	Horizontal
HP	Horsepower
HR	Hour
HTG	Heating
HVAC	Heating, Ventilating, and Cooling
HWY	Highway
HYD	Hydrant
IBC	International Building Code
ID	Inside diameter
IF	Inside face
IFC	International Fire Code
IMC	International Mechanical Code
IN	Inch, inches
INC	Incorporated
INCAND	Incandescent
INCL	Include/inclusive
INSUL	Insulation
INT	Interior
INV	Invert
IPC	International Plumbing Code
IPS	Inside pipe size
JST	Joist
JT	Joint
KD	Knockdown
KIT	Kitchen
KLF	Kips per linear foot
KO	Knockout

KSF	Kips per square foot
KSI	Kips per square inch
L	Left
LAB	Laboratory
LAM	Laminated
LAV	Lavatory
LB	Pound
LF	Linear foot
LG	Length/long
LH	Left hand
LHR	Left hand reverse
LIB	Library
LIN	Linear
LL	Live load
LLH	Long leg horizontal
LLV	Long leg vertical
LNTL	Lintel
LR	Living room
LT	Light
LTG	Lighting
LVR	Louver
MAINT	Maintenance
MAS	Masonry
MATL	Material
MAX	Maximum
MBR	Master bedroom
MDO	Medium density overlay
MECH	Mechanical
MEM	Membrane
MET	Metal
MEZZ	Mezzanine
MFR	Manufacturer
MH	Manhole
MIN	Minimum
MIR	Mirror
MISC	Miscellaneous
ML	Metal lath
MLDG	Molding
MO	Masonry Opening
MTD	Mounted

MTG	Meeting
MTP	Metal toilet partition
MTR	Mortar
MULL	Mullion
MWP	Membrane waterproofing
N	North
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electric Manufacturer's Association
NFPA	National Fire Protection Association
NIC	Not in contract
NO	Number
NOM	Nominal
NPA	National Particleboard Association
NRC	Noise reduction coefficient
NSF	National Sanitation Foundation
NSPI	National Swimming Pool Institute
NTS	Not to scale
O/O	Outside to outside
OA	Overall
OC	On center
OD	Outside diameter
OF	Outside face
OFCI	Owner furnished - contractor installed
OFF	Office
OFOI	Owner furnished - owner installed
OPNG	Opening
OPP	Opposite
OVHD	Overhead
OZ	Ounce
P LAM	Plastic laminate
PAR	Parallel
PB	Panic bar
PBD	Particle board
PCF	Pounds per cubic foot
PCI	Precast Concrete Institute
PDI	Plumbing and Drainage Institute
PERF	Perforated
PERIM	Perimeter

PERP	Perpendicular
PG	Pipe guide
PIV	Post indicator valve
PKG	Parking
PL	Plate
PLAS	Plaster
PLF	Pounds per linear foot
PLY, PLYWD	Plywood
PNL	Panel
PNT	Paint
POL	Polished
PP	Power pole
PR	Pair
PREFAB	Prefabricated
PREFIN	Prefinished
PROJ	Project
PROP	Property
PSF	Pounds per square foot
PSI	Pounds per square inch
PT	Pressure or preservative treated
PTD	Paper towel dispenser
PTN	Partition
PTR	Paper towel receptacle
PVC	Polyvinyl chloride
PVMT	Pavement
QT	Quarry tile
QTY	Quantity
R	Riser
RA	Return air
RAD	Radius
RC	Resilient channel
RCVR	Receiver
RD	Roof drain
REBAR	Reinforcing bar
REC	Recessed
RECPT	Receptacle
RECT	Rectangular
RE	Reference
REF	Refrigerator
REINF	Reinforcing/reinforcement

REM	Removable
REQD	Required
RES	Resistant
RESIL	Resilient
RET	Return
REV	Revise/revision
RFG	Roofing
RH	Right hand
RHR	Right hand reverse
RM	Room
RMV	Remove
RND	Round
RO	Rough opening
ROW	Right of way
RV	Roof vent
S	South
SA	Supply air
SAN	Sanitary
SAT	Suspended Acoustic Tile
SB	Splash block
SC	Solid Core
SCH, SCHED	Schedule
SF	Square Feet
SECT	Section
SHT	Sheet
SHTHG	Sheathing
SHWR	Shower
SIGMA	Sealed Insulating Glass Manufacturers Association
SIM	Similar
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SND	Sanitary napkin dispenser
SNR	Sanitary napkin receptacle
SPEC	Specifications or project manual
SPKLR	Sprinkler
SPKR	Speaker
SQ	Square
ST STL	Stainless steel
ST	Street
STAG	Staggered
STC	Sound transmission classification
STL	Steel

STOR	Storage
STR, STRUCT	Structural/structure
SUB	Subcontractor
SURF	Surface
SUSP	Suspended
SW	Switch
SYM	Symmetrical
T/	Top of
T&B	Top and bottom
T&G	Tongue and groove
T/BM	Top of beam
TEL	Telephone
TEMP	Temporary
TER	Terrazzo
THRSH	Threshold
TOB	Town of Breckenridge
TOC	Top of concrete
TOF	Top of footing
TOJ	Top of joist
TOPO	Topography
TOS	Top of slab
TOW	Top of wall
TP	Telephone pole
TR	Tread
TYP	Typical
UC	Undercut
UF	Under floor
UG	Underground
UH	Unit heater
UL	Underwriters Laboratories, Inc.
UNEX	Unexcavated
UNFN	Unfinished
UON	Unless otherwise noted
UTIL	Utility
VB	Vapor barrier
VCT	Vinyl composition tile
VENT	Vent, venting, ventilating
VERT	Vertical
VEST	Vestibule

VNR	Veneer
VOL	Volume
VR	Vapor retarder
VWC	Vinyl wall covering
W	Wide/width
W	West
W/	With
W/O	Without
WC	Water closet
WD	Wood
WDW	Window
WGL	Wire glass
WH	Water heater
WP	Weatherproof
WSCT	Wainscot
WT	Weight
WWF	Welded wire fabric
YD	Yard

PART TWO PRODUCTS - NOT USED

PART THREE EXECUTION - NOT USED

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 TEMPORARY UTILITIES - SEE SECTION 01 5100

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. Existing facilities may be used.
- C. New permanent facilities may be used.

1.02 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

1.03 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.04 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide protection for plants designated to remain. Replace damaged plants.

1.05 FENCING

- A. Provide 6 foot high fence around construction site unless otherwise noted in construction documents or as required by municipality; equip with vehicular gates with locks.

1.06 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.07 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.08 VEHICULAR ACCESS AND PARKING - SEE ALSO SECTION 01 5500

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.

1.09 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.

1.10 PROJECT SIGNS - SEE SECTION 01 5813

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 5100
TEMPORARY UTILITIES**

PART 1 GENERAL

1.01 TEMPORARY ELECTRICITY

- A. Cost: By the General Contractor.

1.02 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.

1.03 TEMPORARY HEATING

- A. Cost of Energy: By the General Contractor.
- B. Maintain minimum ambient temperature of 40 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.04 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By the General Contractor.
- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5500
VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

PART 2 PRODUCTS

201 MATERIALS

- A. Temporary Construction: at the General Contractor's option.

PART 3 EXECUTION

3.01 ACCESS ROADS

- A. Use of existing on-site streets and parking areas for construction traffic is not permitted unless authorized by municipal authorities.
- B. Tracked vehicles not allowed on paved areas.
- C. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.

3.02 PARKING

- A. Use of existing parking facilities by construction personnel is not permitted.
- B. Provide temporary parking areas to accommodate use of construction personnel.

3.03 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.

3.04 MAINTENANCE

- A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

3.05 REMOVAL, REPAIR

- A. Remove temporary roads before Substantial Completion or at Substantial Completion.
- B. Repair existing and new permanent facilities damaged by use, to specified condition.

END OF SECTION

SECTION 01 5813
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 QUALITY ASSURANCE

1.02 SUBMITTALS

PART 2 PRODUCTS

2.01 PROJECT IDENTIFICATION SIGN

- A. One sign for installation by the Contractor at location designated by Owner.
- B. Content:
 - 1. Names and titles of Architect and Consultants.
 - 2. Name of Prime the General Contractor and major Subcontractors.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Erect at designated location.

3.02 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data Submittals: Submittals shall be in electronic PDF format. Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Submittals shall be in electronic PDF format. Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 2500 - Substitution Procedures.
- B. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

END OF SECTION

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
- B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.

1.02 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- D. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- E. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
- F. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- G. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

PART 3 EXECUTION

3.01 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.03 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing.
- D. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.04 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

3.05 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.06 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

3.07 CLOSEOUT PROCEDURES

END OF SECTION

SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

1.02 SUBMITTALS

- A. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

- A. See Section 01 6000 - Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
 - 1. Relative amount of waste produced, compared to specified product.
 - 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
 - 3. Proposed disposal method for waste product.
 - 4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
- D. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- E. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- F. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- G. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect and Owner in electronic PDF format suitable for archival storage: external hard drive, USB drive or approved alternate method.
- B. Operation and Maintenance Data:
 - 1. Submit electronic copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Addenda.
 - 3. Change Orders and other modifications to the Contract.
 - 4. Reviewed shop drawings, product data, and samples.
 - 5. Manufacturer's instruction for assembly, installation, and adjusting.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- C. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

END OF SECTION

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUBMITTALS

- A. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
- B. Training Manuals: Provide electronic training manual in PDF format for each attendee; allow for minimum of two attendees per training session.
- C. Training Reports:
- D. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstration may be combined with Owner personnel training if applicable.
- C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
- D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.

3.02 TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.
- B. Owner will provide classroom and seating at no cost to the General Contractor.
- C. Provide training in minimum two hour segments.
- D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge the General Contractor for personnel "show-up" time.

END OF SECTION

SECTION 02 30 00
SUBSURFACE INVESTIGATION

PART 1 GENERAL

1.1 SUMMARY

- A. Subsurface investigations and reporting have been performed for the purpose of obtaining data for the planning and design of this project. Copies of such reporting are available from the Owner.

1.2 LIMITATIONS

- A. The subsurface investigations and reporting are being made available solely for the convenience of the Bidder and shall not relieve the Bidder or the Contractor of any risk, duty to make examinations and investigations as required by Article 4 of the Instructions to Bidders, or any other responsibility under the Contract Documents.
- B. It is mutually agreed to by all parties:
1. Written reports are reference documents and are not part of the Contract Documents.
 2. Subsurface investigations are for the purpose of obtaining data for planning and design of the project.
 3. Data concerning borings and test pits is intended to represent with reasonable accuracy conditions and material found in specific borings and test pits at the time the borings and test pits were made.
- C. It is expressly understood and agreed the Owner and Engineer assume no responsibility whatsoever in respect to the sufficiency or accuracy of the investigation thus made, the records thereof, or of the interpretations set forth therein, or made by the Owner in his use thereof; and there is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations, or records thereof, are representative of those existing throughout such areas, or any part, or that unforeseen developments may not occur.
- D. The Owner's subsurface investigations and reporting are made available to Bidder or Contractor only on the basis of the understandings and agreement herein stated.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of existing facilities.
 - 2. Abandoning and removing utilities.

1.2 RELATED SECTIONS:

- A. Section 31 05 16 - Aggregates for Earthwork
- B. Section 31 10 00 - Site Clearing
- C. Section 31 22 13 - Rough Grading
- D. Section 31 23 16 - Excavation

1.3 SUBMITTALS

- A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.
- B. Submit to Engineer a copy of written permission of private property owners, with copy of fill permit for said private property, as may be required for disposal of materials.

1.4 QUALITY ASSURANCE

- A. Existing Conditions: Determine the extent of work required and limitations before proceeding with Work.
- B. Conform to applicable local, state, and federal codes for environmental requirements in relation to disposal of debris.
 - 1. Burning at the Site for the disposal of refuse, debris, and waste materials resulting from demolition and site clearing operations shall not be permitted.
- C. Permits: The Contractor is responsible for obtaining all necessary permits required for completion of the Work described in this Section.
- D. Protection of Persons and Property: Meet all federal, state, and local safety requirements for the protection of workmen, other persons, and property in the vicinity of the Work and requirements of the General Provisions.
- E. If the existing material to be demolished and removed contains any hazardous materials which will require special handling upon removal, such as asbestos or lead, it is the responsibility of the Contractor to remove and dispose of the material in accordance with all applicable federal, state and local regulations.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Existing Materials: All materials, equipment, miscellaneous items, and debris involved, occurring, or resulting from demolition, clearing, and grubbing work shall become the property

of the Contractor at the place of origin, except as otherwise indicated in the Drawings or Specifications.

- B. Crushed Rock: As specified in Section 31 05 16-2.1, Aggregates for Earthwork. Of the size shown in the Drawings or specified herein.
- C. Sand: As specified in Section 31 05 16-2.2, Aggregates for Earthwork.

PART 3 EXECUTION

3.1 EXAMINATION

- A. The Owner assumes no responsibility for the actual condition of the facilities to be demolished. The Contractor shall visit the site, inspect all facilities and be familiar with all existing conditions and utilities.
- B. Demolition drawings identify major equipment and structures to be demolished only.
- C. Identify waste and salvage areas for placing removed materials.

3.2 PREPARATION

- A. Carefully coordinate the work of this Section with all other work and construction.
- B. Call Local Utility Line Information service at 811, not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
 - 2. Disconnect or arrange for disconnection of utilities (if any) affected by required work.
 - 3. Keep all active utilities intact and in continuous operations.

3.3 PROTECTION

- A. Utilities: Locate, identify, and protect utilities located by utilities and indicated in the Drawings to remain from damage.
- B. Survey control: Protect benchmarks, survey control points, and existing structures from damage or displacement.
- C. Preservation and Trimming of Trees, Shrubs and Other Vegetation: As specified in Section 31 10 00-3.4.C, Site Clearing.
- D. Landscaped Areas: Protect existing landscaped areas as specified in Section 31 10 00-3.4.D, Site Clearing.
- E. Miscellaneous Site Features: Protect all existing miscellaneous site features from damage by excavating equipment and vehicular traffic, including but not limited to existing structures, fences, picnic tables, mailboxes, sidewalks, paving, guy wires, utility poles, and curbs.
- F. Repair and Replacement:

1. Damaged items, including but not restricted to those noted above, shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of Work of this contract.
2. Any damage to existing facilities or utilities to remain as caused by the Contractor's operations shall be repaired at the Contractor's expense.

3.4 DEMOLITION

- A. Areas which are to be excavated for the purpose of demolition shall be cleared and stripped in accordance with Section 31 10 00-3.6, Site Clearing.
- B. Carefully consider all bearing loads and capacities for placement of equipment and material on site. In the event of any questions as to whether an area to be loaded has adequate bearing capacity, consult with Engineer prior to the placement of such equipment or material.
- C. Demolition of Existing Structures:
 1. Excavate around existing structures as required to perform demolition operations and to plug associated existing pipelines where shown in the Drawing.
 2. Provide shoring, bracing, and supports, as required, to ensure adjacent structures are not damaged and structural elements of existing structure are not overloaded during demolition activities.
 - a. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed under any part of this Contract.
 - b. Remove all temporary protection when the Work is complete or when so authorized by the Engineer.
 3. Any floors or slabs that are to remain in place shall be completely cracked through to allow for drainage. Cracking shall be accomplished by dropping a demolition ball or by other methods approved by the Engineer.
 4. Remove and dispose of all exposed and/or protruding metalwork, piping, plumbing, and conduits resulting from demolition activities, and all woodwork, roofing, and electrical and mechanical equipment removed from demolished structures.
 - a. Reinforcing bars shall be cut flush with final wall elevations as shown in the Drawings.
 - b. No detached metalwork, excluding concrete reinforcing bars, shall be buried with the concrete and masonry rubble.
- D. Backfill at Demolished Structures:
 1. For structures designated to be abandoned and/or demolished in place, concrete and/or masonry rubble and excavated soils resulting from demolition activities shall be used for backfill or placed in the bottoms of said structures only as directed by the Engineer.
 2. Concrete and masonry rubble used for backfilling shall be broken into pieces no larger than 6 inches on any one side.

3. Materials resulting from abandonment/demolition activities approved for backfill shall be combined with imported filler sand to create a dense, compacted backfill.
4. Backfilling or placement of the excavated material in the structures shall meet the following requirements.
 - a. Furnish, place and compact filler sand along with the concrete and masonry rubble so that all voids are filled and a dense, compacted backfill is obtained.
 - b. Filler sand shall be placed in horizontal layers completely filling all voids between pieces of rubble and not exceeding 12 inches in thickness.
 - c. Each layer of filler sand shall be compacted to obtain at least 90 percent of maximum density as determined by ASTM Method D-698-78 (AASHTO T-99).
 - d. Water shall be furnished by the Contractor and added to each layer as required to maintain optimum moisture content.
 - e. The amount of filler sand used shall only be the amount needed to fill all voids created by placement of the concrete and asphalt rubble, as directed by the Engineer.
 - f. At locations where concrete and masonry rubble are used for backfill, they shall be placed such that a minimum of 3 feet of compacted non-rubble backfill material (crushed rock) exists between any rubble and finished grade. Protruding reinforcing bars shall be cut to lengths that allow granular backfill to be placed and compacted to required levels in and above the rubble.
5. Disposal of all materials not used for backfill shall be performed off-site and in compliance with applicable local, state, and federal codes and requirements.
6. In areas where new construction will take place, no trace of these structures shall remain prior to placing of backfill.
- E. Backfilling within the footprint of new structures with rubble material resulting from demolition activities will not be allowed.
- F. All existing improvements designated in the Drawings or specified to be removed, including but not limited to structures, pipelines, walls, footings, foundations, slabs, pavements, curbs, fencing, and similar structures occurring above, at, or below existing ground surface shall be included in the demolition work.
- G. Unless otherwise specified, any resulting voids shall be backfilled with suitable excavated or imported material compacted to the density of the adjacent soil.

3.5 ASPHALTIC CONCRETE DEMOLITION

- A. Asphalt pavement shall be removed to the limits shown in the Drawings.
- B. The limits of the removal shall be saw cut, protecting the pavement to remain.
- C. Asphalt pavement may not be used as rubble fill.

3.6 CONCRETE SIDEWALK AND CURB AND GUTTER DEMOLITION

- A. Concrete shall be removed to the limits shown in the Drawings.

- B. The limits of the removal shall be saw cut, protecting the concrete to remain.

3.7 REMOVAL

- A. Remove debris, rock, excavated materials, rubble, abandoned piping, and extracted plant life resulting from abandonment and/or demolition activities from site.
- B. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- C. Removal: All material resulting from demolition, clearing, and grubbing, and trimming operations shall be removed from the project site and disposed of in a lawful manner. Materials placed on property of private property owners shall be by written permission only.

3.8 GRADING

- A. All grading work shall be completed in accordance with Section 31 22 13, Rough Grading.

3.9 CLEANUP:

- A. During and upon completion of work, promptly remove all unused tools and equipment, surplus materials, debris, and dust and leave all areas affected by the work in a clean, condition, as may be subject to Engineer approval.
- B. Adjacent structures shall be cleaned of dust, dirt, and debris resulting from demolition.
- C. Adjacent areas shall be returned to their existing condition prior to the start of work.

3.10 SCHEDULES

- A. The following materials and structures are to be demolished and removed for the project site:
 - 1. As shown on the plans.
- B. Protect the following materials and structures:
 - 1. As shown on the plans.

END OF SECTION

SECTION 26 0100
ELECTRICAL GENERAL PROVISIONS

1.01 GENERAL CONDITIONS

- A. The Instructions to Bidders, General Conditions, Special Conditions, Addendas, Alternates, these technical specifications and all drawings, together with the Form of Proposal and Agreement, comprise the Contract Documents for the Electrical Contract. The Electrical Contractor shall examine all of these documents prior to submitting his or her proposal.
- B. The Contractor is required to read carefully the specifications for all parts of the work so as to become familiar not only with the work covered by this Section, but also that of other Divisions and Sections, including all drawings.
- C. Refer to the General Requirements and other Divisions - many of the general requirements stated therein are applicable to the electrical work and coordination of the two trades is covered.
- D. The Contractor shall watch the progress of the work and report to the Architect immediately any cases where ample space has not been provided to accommodate his work. He must not cut through any finished work until he has received permission from the Architect. No claims for extra work will be allowed because of misinterpretation of Plans and Specifications, or due to conflict between trades for usable space.
- E. The Contractor is invited to submit alternative methods or materials as a cost reduction factor, however, safety and integrity of the systems must be maintained. These alternative methods or materials are not to be implemented unless written permission is provided by the Architect.
- F. The General Contractor shall be responsible for all work included in this section and the delegation of work to the Electrical Contractor, shall not relieve him of this responsibility. The Electrical Contractor and his subcontractors who perform work under this section shall be responsible to the General Contractor.

CONTENTS

2.01 GENERAL REQUIREMENTS FOR ELECTRICAL WORK DESCRIBED HEREIN AS THE FOLLOWING:

- A. Scope.
- B. Work not Included.
- C. Quality Assurance, Standards and Symbols.
- D. Fees and Inspection Certificates.
- E. Materials.
- F. Submittals.
- G. Substitutions.
- H. Temporary Power and Light.
- I. Electrical Drawings.
- J. Coordination.
- K. Sleeves, Inserts, Fastenings, Supports, Cutting and Patching.
- L. Scaffolding
- M. Trenching and Backfilling
- N. Testing, Adjusting, Cleaning
- O. As-Built Drawings
- P. Operation and Maintenance Manuals.

202 SCOPE OF WORK

- A. Any apparatus, appliance, material or work not shown on drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed by the Contractor without additional expense to the Owner.
- B. Minor details not usually shown or specified, but necessary for proper installation and operation, shall be included in the Contractor's estimate, the same as if herein specified or shown. It is the intention of the Specifications and Drawings to call for finished work, tested, and ready for operation.
- C. With submission of bid, the Electrical Contractor shall give written notice to the Architect of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, or rules; and any necessary items or work omitted. In the absence of such written notice, it is mutually agreed the Contractor has included the cost of all required items in his proposal, and that he will be responsible for the approved satisfactory functioning of the entire system without extra compensation.

203 THE WORK CONSISTS OF THE FOLLOWING:

- A. Solar powered bollards, as indicated on landscape drawings.
- B. Bases for solar powered pole lights, as indicated on landscape drawings.
- C. (2) 3" diameter underground conduit from future stage and future pavilion locations to future elec meter/panel location, adjacent to existing electrical transformer at northeast corner of project area. Coordinate exact location of terminations and future panel/meter location with Owner.
- D. Provide all trenching, backfill and compaction from the future stage and pavilion locations to future elec meter/panel location per contract requirements and utility company standards.
- E. Cutting and patching of holes required for the installation in concrete, wood, steel or masonry.
- F. Repair of all damage done to the premises as a result of the installation and removal of all debris or surplus material left by those engaged in the work.
- G. Complete and thorough cleaning of all equipment furnished and installed, both inside and outside, and made ready for painting by others, if applicable.
- H. Provisions and installation of all bases, supports, hangers and vibration isolators for the work outlined herein.
- I. Cooperation with other crafts in putting the installation in place at any time when space required is ready and the progress of the work so dictates.

204 WORK NOT INCLUDED

- A. The following work is not included in this Division unless specifically called for in individual Sections:
- B. Motors and controls, unless indicated otherwise, shall be furnished by others, but shall be installed and connected by the Electrical Contractor as indicated on the drawings.
- C. Telephone, CATV, High-Speed Internet and LAN equipment, instruments, switches, and service entrance cabling shall be furnished and installed by the utility company.

205 QUALITY ASSURANCE, STANDARDS AND SYMBOLS

- A. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards, utility company and fire insurance carrier's requirements. Contact proper authorities, obtain and pay for required permits, inspections and utility service connections. Do not include any utility
 - 1. company charges that can be billed directly to the Owner.
- B. In case of difference between the building codes, specifications, state laws, local ordinances, industry standards, utility company regulations, fire insurance carrier's requirements, and the contract documents, the most stringent shall govern. The Contractor shall promptly notify the Architect in writing of any such difference
- C. Noncompliance: Should the Contractor perform any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, fire insurance carrier's requirements, and utility company regulations, he shall bear the cost arising in correcting any such deficiency.
- D. Applicable codes and all standards shall include all state laws, local ordinances, utility company regulations and the applicable requirements of the following nationally accepted codes and standards:
 - 1. Building Codes
 - 2. National Building Code.
 - 3. Local Building Code.
 - 4. National Electrical Code.
 - 5. State Electrical Code.
 - 6. Local Municipal Electrical Code
 - 7. Industry Standards, Codes, and Specifications
 - 8. AMCA -Air Moving and Conditioning Association.
 - 9. ASHRAE - American Society of Heating, Refrigeration, and Air Conditioning Engineers.
 - 10. ASME - American Society of Mechanical Engineers.
 - 11. ASTM - American Society for Testing and Materials.
 - 12. EIA -Electronic Industries Association.
 - 13. IEEE - Institute of Electrical and Electronic Engineers.
 - 14. IPCEA - Insulated Power Cable Engineers' Association.
 - 15. NEC - National Electrical, Code (NFPA No. 70-1996).
 - 16. NBS - National Bureau of Standards.
 - 17. NEMA -National Electrical Manufacturers' Association.

18. NFPA - National Fire Protection Association.
 19. USASI - United States of America Standards Institute.
 20. UL -Underwriters' Laboratories.
 21. Insurance Carriers
 22. FIA - Factory Insurance Association.
 23. FMED - Factory Mutual Engineering Division.
- E. The Drawings are diagrammatic and indicate generally the locations of material and equipment. These Drawings shall be followed as closely as possible. The Electrical Contractor shall coordinate the work under this section with the architectural, structural, plumbing, heating and air conditioning, and the drawings of other trades for exact dimensions, clearances and roughing-in locations. This Contractor shall cooperate with all other trades in order to make minor field adjustments to accommodate the work of others. Do not rely on the scale of the drawings for rough-in measurements, nor use them as Shop Drawings.
 - F. All materials and equipment for which label service is available shall bear the label of the Underwriters' Laboratories Inc.
 - G. Guarantee: This Contractor shall guarantee his workmanship and material (incandescent lamps, fuses, and any existing equipment are exempt) for a period of one year from the date of final acceptance and leave his work in perfect order at completion. Should defects develop within the guarantee period, this Contractor shall, upon notice of same, remedy the defects and have all damages to other work or furnishings caused by the defects or the work of correcting same repaired and/or replaced at his expense, to the condition before such damage.

206 FEES AND INSPECTION CERTIFICATES

- A. The Contractor shall obtain and pay for all permits and inspection services and certificates in conjunction with this work.
- B. Upon completion of the work, Contractor shall obtain the approval of all recognized agencies concerned with the work, along with the approval of the National Board of Fire Underwriters, such certificates of inspection and approval from said bureau and/or agencies must be submitted to the Architect.

207 MATERIALS

- A. Refer to Division 1 sections for general requirements on products, materials and equipment.
- B. All materials shall be new, the best of their respective kinds, unless otherwise specified, and shall be installed by labor thoroughly skilled in the class of work anticipated by this Contract.
- C. Provide products which are compatible with other products of the electrical work and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with otherwork.
- D. All equipment and materials used in relation to control work for the project shall be new and shall bear the manufacturer's name and trade name. The equipment and material shall be essentially the standard product of a manufacturer regularly engaged in the production of the required type of equipment and shall be the manufacturer's latest approved design.
- E. Unless otherwise indicated, all heating, ventilating, air conditioning, plumbing, and other mechanical equipment, motors, and controls shall be furnished, set in place and wired as follows:

208 SUBMITTALS

- A. Furnish the Architect with complete shop drawings and associated data in accordance with General Conditions, for all major elements of the Electrical work for review, checking and approval. None of the following equipment shall be fabricated, delivered, erected or connected other than from drawings officially approved by the Architect.
- B. Lighting fixtures, lighting control panels, dimmers, lamps and ballasts.
- C. Conduit, wiring, and fittings.
- D. Toggle switches, receptacles, and face plates.

- E. The Electrical Contractor shall furnish electronic copies of shop drawings or brochures for all fixtures, equipment, and accessories to the Engineer for the Engineer's approval.
- F. The Electrical Contractor shall furnish and present electronic copies of a schedule of manufacturers of all materials for which shop drawings or brochures are not presented.
- G. No equipment shall be ordered, purchased, or installed prior to approval of the shop drawings, brochures, and schedules. Checking is only for general conformance with the design concept of the project and general compliance shown is subject to the requirements of the plans and specifications.
- H. Contractor is responsible for: dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.

210 SUBSTITUTION OF MATERIALS

- A. In general, the contract drawings and specifications show and describe arrangements suitable for the specific items of equipment either named or described. In the event that Contractor submits for approval, and receives such approval, for a device or piece of equipment which requires connections or arrangements of these services differing from those indicated or described in the contract documents, Contractor shall give timely notice and shall make suitable alterations in the work to accommodate the substitute equipment, and shall be responsible for any and all additional costs incurred by virtue of the substitution of such equipment for the equipment named or described in the contract documents.
- B. The naming of a certain brand or make or manufacturer in the specifications is to establish a quality standard for the article desired. The Contractor is not restricted to the use of the specific brand of the manufacturer named unless so indicated in the specifications. However, where a substitution is requested, a substitution will be permitted only with the written approval of the Architect. Request for such substitutions shall be submitted in triplicate to the Architect at least five working days prior to the Bid Opening date. Requests, as such, shall be accompanied by Manufacturer's Data Sheets and other information in the opinion of the Architect that is necessary for review. No substitute material or equipment shall be ordered, fabricated, shipped or processed in any manner prior to the approval of the Architect. The Contractor shall assume all responsibility for additional expenses as required in any way to meet changes from the original material or equipment specified.

211 TEMPORARY POWER AND LIGHTING

- A. The Electrical Contractor shall be responsible for all arrangements and costs for providing temporary electrical metering, main switches, and distribution panels at the site as required for construction purposes. The distribution panels shall be located at a central point designated by the Architect. The General Contractor shall indicate prior to installation whether three phase or single-phase service is required.

212 INSTALLATION

- A. Install work in neat and orderly manner.
- B. Make structurally and electrically sound throughout.

- C. Maintain to give continuous service and to provide safe working conditions.
- D. Modify and extend service as work progress requires.
- E. Provide circuit breaker protection for each outlet with ground fault interrupting capacity.
- F. Provide equipment grounding continuity for entire system.
- G. Completely remove temporary materials and equipment upon completion of construction. Repair damage caused by installation, and restore to specified or original condition.

213 ELECTRICAL DRAWINGS

- A. Electrical Drawings have not been provided. Refer to landscape plans for location and quantity of fixtures.
- B. The Drawings and Specifications are complementary, each to the other, and the work required by either shall be included in the Contract as if called for by both.
- C. If directed by the Architect, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.
- D. The drawings are indicative of the work to be installed, but do not show all bends, fittings, boxes and specialties required to complete the installation.
- E. The Electrical Contractor shall note that all items of equipment are specified in the singular; however, the Contractor shall provide and install the number of items of equipment as indicated on the drawings and as required for complete systems.
- F. Where it is stated that the contractor shall "provide" a device or piece of equipment, it shall mean that such devices or equipments are furnished and installed.

214 COORDINATION

- A. General: Refer to the Division 1 sections for general coordination requirements applicable to the entire work. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the electrical work, and in its interface with other work including utilities and mechanical work, and that such establishment is the exclusive responsibility of the Contractor.
- B. Install the wiring and equipment at such times and in such manner as will in no way retard progress or completion of the project. Arrange electrical work in a neat, well organized manner with conduit and similar services running parallel with primary lines of the building construction,

and with a minimum of 7'0" overhead clearance where possible. Locate operating and control equipment properly to provide easy access and arrange entire electrical work with adequate access for operation and maintenance. Advise other trades of openings required in their work for the subsequent move-in of large units of electrical work (equipment).

2.15 SCAFFOLDING

- A. Furnish and erect all scaffolding, ladders, etc., required in the installation of wiring, equipment and fixtures.

2.16 TRENCHING AND BACKFILLING

- A. Perform all trenching and backfill required by work under this division of the specifications.
- B. Trenching and backfilling shall be done in accordance with the "Site Work" division of the specifications and as herein specified. This portion of the work shall be executed under the direct supervision of the General Contractor. Trenches shall be excavated to the depth required for the utilities involved. The trench bottom shall be graded true and free from debris, stones and soft spots. Where direct burial cables are used, four inches of fine sand shall be placed in the bottom of the trench prior to cable placement.
- C. Refer to Town and utility requirements for information regarding the marking of underground conduit with marker tape.

2.17 TESTING, ADJUSTING AND CLEANING

- A. The Contractor shall test the entire system in the presence of the Architect or his engineer when the system is finally completed to insure that all portions are free from short circuits or ground faults.
- B. The Electrical Contractor shall provide the Architect with certification of the inspection and approval of an active member of the International Association of Electrical Inspectors of all work completed and included in the section, if required. The Contractor shall be responsible for notifying the Inspector when work reaches inspection stage.
- C. The Electrical Contractor shall pay for all permits, inspection fees, and installation fees as required to complete the work under this Section of the Contract.
- D. This Contractor shall guarantee the materials and workmanship for a period of twelve (12) months from the time the installation is accepted by the Owner. If, during this time, any defects should show up due to any defective materials, workmanship, negligence or want of proper care on the part of this Contractor, he shall furnish any new materials as necessary, repair said defects, and put the system in order at his own expense on receipt of notice of such defects from the Architect. This specification is not intended to imply that the Electrical Contractor shall be responsible for negligence of the Owner.
- E. Upon completion of the work, all component parts, both singularly and as a whole, shall be adjusted and left in satisfactory condition. All parts of the installation, including lighting fixtures, panelboards, etc., shall be cleaned, dusted or washed and adjusted to the satisfaction of the Architect.

2.18 OPERATION AND MAINTENANCE MANUALS

- A. Contractor shall prepare, assemble and submit one hard copy and one electronic copy of an Operation and Maintenance Manual for the electrical system as installed.
- B. Operation and Maintenance manuals shall be typed and bound in a hard cover, three ring binder or equivalent protection, and shall contain as a minimum the following:
- C. Shop drawings or catalog product literature of all material listed in Submittals paragraph.
- D. Wiring diagrams and instructions for fire alarm system, contactors, motor starters and time clocks.
- E. Control drawings for any systems not furnished under other contracts.
- F. Maintenance instructions for all equipment furnished under this contract.
- G. Table of equipment listing motor starter sizes, overload sizes, and fuse sizes.

- H. Table of light fixtures listing manufacture and model number; lamp type, manufacture and model number; ballast type, manufacture and model number.
- I. A list of contacts with phone numbers for all systems for Owners' use, in the event the electrical system requires service work within the Warranty period.
- J. Copy of Certificate of Acceptance from the Electrical Inspector, Fire Marshall and any other applicable authorities.
- K. Copy of Warranty Letter from Electrical Contractor and appropriate sub-contractors.

END OF SECTION

SECTION 31 05 13
SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes range of soil and subsoil materials intended to be referenced by other sections, generally for fill and grading purposes. Materials are indicated by "Type" to assist in referencing from other sections and on Drawing notes.
- B. Section includes:
 - 1. Subsoil materials

1.2 RELATED SECTIONS

- A. Section 31 05 16 – Aggregates for Earthwork
- B. Section 31 10 00 – Site Clearing
- C. Section 31 22 13 – Rough Grading
- D. Section 31 23 16 – Excavation
- E. Section 31 23 18 – Rock Removal
- F. Section 31 23 23 – Fill
- G. Section 31 37 00 – Riprap

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
 - 2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
- B. ASTM International (ASTM):
 - 1. ASTM D698 test methods correspond with AASHTO T99,
 - 2. ASTM D1557 test methods correspond with AASHTO T180.
 - 3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
 - 4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 - 5. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
 - 6. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- C. Colorado Department of Transportation (CDOT):
 - 1. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the **Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction**. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.4 SUBMITTALS

- A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.
- B. Materials Source: Submit name of imported material's source.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Furnish materials of each type from same source throughout the Work.
- B. Soil Testing:
 - 1. Soil sampling and testing to be completed by an independent laboratory approved by the Engineer.
 - 2. Frequency of testing shall be determined by the Engineer.
 - 3. All soil testing shall be paid for by the Contractor.
- C. Compaction Tests:
 - 1. Maximum density at optimum moisture content as determined by:
 - a. T99 for cohesive soils
 - b. T180 for coarse grained soils
 - 2. In-place density in accordance with Nuclear Testing Method, ASTM D6938.
 - 3. Compaction testing shall be paid for by the Contractor.
- D. Soil Classification: All imported materials shall be classified in accordance with ASTM D2487.

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

- A. Subsoil Type S1, Select Native Material:
 - 1. Class 2 material in accordance with Standard Specifications **Section 703.09**.
- B. Subsoil Type S2, Imported Fill Material:
 - 1. Class 1 material in accordance with Standard Specifications **Section 703.09**.

2.2 SPOILS

- A. All excess material not suitable or not required for backfill and grading shall be hauled off site and disposed of at a location provided by the Contractor and approved by the Engineer.
- B. Make arrangements for disposal of the material at no additional cost to the Owner.
- C. Landfill permit to be obtained by the Contractor and provided to Engineer prior to commencement of disposal.

2.3 SOURCE QUALITY CONTROL

- A. When tests indicate materials do not meet specified requirements, change material or vary compaction methods and retest. Additional testing shall be completed and paid for by the Contractor with no reimbursement by the Owner.
- B. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

- A. Excavate material of every nature and description to the lines and grades as indicated on the Drawings and/or as required for construction of facilities.
- B. Site within clearing limits shall be stripped of topsoil as required to obtain additional topsoil necessary to complete Work indicated in the Drawings or as specified.

- C. When practical, do not excavate wet topsoil.
- D. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.
- E. Remove excess excavated subsoil and topsoil not intended for reuse from Site.
- F. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from Site.

3.2 STOCKPILING

- A. Stockpile soils at locations shown in the Drawings or at locations as approved by Engineer for redistribution as specified.
 - 1. Site may not have sufficient area to stockpile excavated material that will be required for fill later in the project. If additional stockpile area is required to complete the Project on schedule, arrange off-site stockpile areas.
 - 2. No additional payments will be made for stockpiling excavated materials off-site.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Prevent intermixing of soil types or contamination.
- E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
 - 1. Grade surface of stockpiles to prevent ponding of water
 - 2. Cover stockpiles to minimize the infiltration of water.
- F. Stockpile unsuitable and/or hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.
- B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 05 16
AGGREGATES FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes a range of coarse and fine aggregate materials intended to be referenced by other Sections, generally for fill and grading purposes. Materials are indicated by "Type" to assist in referencing from other Sections and in Drawing notes.
- B. Section Includes:
 - 1. Coarse aggregate materials
 - 2. Fine aggregate materials

1.2 RELATED SECTIONS

- A. Section 31 05 13 - Soils for Earthwork
- B. Section 31 22 13 - Rough Grading
- C. Section 31 23 19 - Dewatering
- D. Section 31 23 23 - Fill
- E. Section 31 37 00 - Riprap
- F. Section 32 11 23 - Aggregate Base Courses

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses
 - 2. AASHTO T27 - Sieve Analysis of Fine and Coarse Aggregates
 - 3. Instructions: For #3, select appropriate AASHTO standard based upon input/standards of client.
 - 4. If no preference is standard, Murraysmith standard is T99.
 - 5. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
 - 6. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
 - 7. AASHTO TP61 - Standard Method of Test for Determining the Percentage of Fracture in Coarse Aggregate
- B. ASTM International (ASTM):
 - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
 - 2. Instructions: For #2; select appropriate ASTM standard based upon input/standards of client.
 - 3. ASTM D698 test methods correspond with AASHTO T99
 - 4. ASTM D1557 test methods correspond with AASHTO T180.
 - 5. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
 - 6. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 - 7. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
 - 8. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - 9. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

C. Colorado Department of Transportation (CDOT):

1. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the **Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction**. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.4 SUBMITTALS

- A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.
- B. Materials Source: Submit name of imported materials suppliers.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- D. Results of aggregate sieve analysis and standard proctor tests for all granular material.

1.5 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.
- B. Aggregate Testing:
 1. Aggregate sampling and testing to be completed by an independent laboratory approved by the Engineer.
 2. The frequency of testing shall be determined by the Engineer.
 3. All aggregate testing shall be paid for by the Contractor.
- C. Compaction Tests:
 1. Maximum density at optimum moisture content determined by AASHTO T180.
 2. In-place density in accordance with Nuclear Testing Method, ASTM D6938.
 3. The frequency of testing shall be determined by the Engineer.
 4. All compaction testing shall be paid for by the Contractor.
- D. Aggregate Classification: All imported materials shall be classified in accordance with ASTM D2487.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

- A. In accordance with Standard Specifications **Section 703**.

2.2 FINE AGGREGATE MATERIALS

- A. In accordance with Standard Specifications **Section 703**.

2.3 STRUCTURAL FILL

- A. Class 1 or Class 2 structure backfill material in accordance with Standard Specifications Section 703.09.

2.4 FILTER MATERIAL

- A. Class B material in accordance with Standard Specifications **Section 703.10**.

PART 3 EXECUTION

3.1 STOCKPILING

- A. Stockpile materials imported to site as shown in the Drawings or at locations as approved by Engineer for redistribution as specified.

- B. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.
- C. Prevent intermixing of aggregate types or contamination.
- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
 - 1. Grade surface of stockpiles to prevent ponding of water.
 - 2. Cover stockpiles to minimize the infiltration of water.

3.2 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.
- B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes clearing site of incidental paving and curbs, debris, grass, trees, and other plant life in preparation for site or building excavation work.

1.2 RELATED SECTIONS:

- A. Section 02 41 00 - Demolition
- B. Section 31 22 13 - Rough Grading
- C. Section 31 23 18 - Rock Removal

1.3 DEFINITIONS

- A. Clearing: Removal of interfering or objectionable material lying on or protruding above ground surface.
- B. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots greater than 2-inch caliper to a depth of 12 inches below subgrade.
- C. Interfering or Objectionable Material: Trash, rubbish, and junk; vegetation and other organic matter, whether alive, dead, or decaying; topsoil.
- D. Limits of Disturbance: Work area boundary as shown on the Plans.
- E. Root Wad: Tree stump and root mass including all roots greater than 1-inch diameter.
- F. Stripping: Removal of topsoil remaining after applicable scalping is completed.

1.4 SUBMITTALS

- A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.
- B. Clearing, Grubbing, and Stripping Plan: Drawings clearly showing proposed limits to clearing, grubbing, and stripping activities at Site.
- C. Certification or disposal permit for landfill and/or waste disposal site.
- D. A copy of written permission of private property owners, with copy of fill permit for said private property, as may be required for disposal of materials.

1.5 QUALITY ASSURANCE

- A. Existing Conditions: Determine the extent of Work required and limitations before proceeding with Work.
- B. Obtain Engineer's approval of staked clearing, grubbing, and stripping limits prior to commencing clearing, grubbing, and stripping.
- C. Conform to applicable local, state, and federal codes for environmental requirements and disposal of debris,
 - 1. Burning on project site will not be permitted.
 - 2. Use of herbicides will not be permitted.
- D. Permits: The Contractor is responsible for obtaining all necessary permits required for completion of the Work described in this Section.
- E. Protection of Persons and Property: Meet all federal, state, and local safety requirements for the protection of laborers, other persons, and property in the vicinity of the work and requirements of the General Provisions.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Existing Materials: All materials, equipment, miscellaneous items, and debris involved, occurring or resulting from demolition, clearing, and grubbing work shall become the property of the Contractor at the place of origin, except as otherwise indicated in the Drawings or specifications.
- B. Wound Paint: Emulsified asphalt formulated for use on damaged plant tissues.

PART 3 EXECUTION

3.1 GENERAL

- A. Clear, grub, and strip areas needed for waste disposal, borrow, or Site improvements within limits shown in approved Clearing, Grubbing, and Stripping Plan.
- B. Remain within the property lines at all times.
- C. Do not injure or deface vegetation or structures that are not designated for removal.

3.2 EXAMINATION

- A. Verify existing plant life designated to remain is tagged or identified.
- B. Identify waste and salvage areas for placing removed materials.

3.3 PREPARATION

- A. Call Local Utility Line Information service at 811, not less than three working days before performing Work.
- B. Request underground utilities to be located and marked within and surrounding construction areas.
 - 1. Disconnect or arrange for disconnection of utilities (if any) affected by required work.
 - 2. Keep all active utilities intact and in continuous operations.
- C. Prepare Site only after:
 - 1. Erosion and sediment controls are in place.
 - a. Limit areas exposed uncontrolled to erosion during installation of temporary erosion and sediment controls and in compliance ESC Permits.
 - 2. Tree and vegetation protection is installed.
 - a. Protect existing site improvements, trees, and shrubs to remain to preclude damage during construction.
 - b. Follow the provisions set forth in 01 56 39, Temporary Tree and Plant Protection for all temporary tree and plant protection measures.
 - 3. Temporary fencing is installed along the Limits of Disturbance.
 - 4. Notification of utility agencies; disconnect or arrange for disconnection of utilities (if any) affected by required work. Keep all active utilities intact and in continuous operation.

3.4 PROTECTION

- A. Utilities: Locate, identify, and protect utilities located by utilities and indicated in the Drawings to remain from damage.
- B. Survey control: Protect benchmarks, survey control points, and existing structures from damage or displacement.
- C. Preservation and Trimming of Trees, Shrubs, and Other Vegetation:
 - 1. Avoid injury to trees, shrubs, vines, plants, grasses, and other vegetation growing outside of the areas to be cleared and grubbed and those trees and shrubs designated to be preserved.

2. Protect existing trees and shrubs against cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of roots by stockpiling construction materials, excavated materials, excess foot or vehicular traffic, and parking of vehicles within drip line.
 3. Provide temporary guards, as necessary, to protect trees and vegetation to be left standing.
 4. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
 5. Provide protection for roots and limbs over 1-1/2-inch diameter cut during construction operations. Coat cut faces with emulsified asphalt.
 6. Repairable damage to trees and shrubs designated to remain shall be made by a professional tree surgeon approved by the Engineer. Cost shall be borne by the Contractor.
- D. Landscaped Areas:
1. When any portion of the Work crosses private property or landscaped areas, excavate topsoil separately and pile it on the opposite side of the trench from the subsoil.
 2. Conduct Work in a manner that will restore original conditions as nearly as practicable.
 3. Remove and replace any trees, shrubs, plants, sod, or other vegetative material as needed to complete Work.
 4. All shrubs or plants shall be balled by experienced workers, carefully handled and watered, and replaced in their original positions without damage. Sod shall be handled in a similar manner.
 5. Wherever sod cannot be saved and restored, the ground must be reseeded and cared for until a stand of grass is reestablished.
 6. Plants or shrubs killed or destroyed shall be replaced and paid for by the Contractor.
 7. It is the intent of this paragraph that the Contractor shall leave the surface and plantings in substantially the same conditions as before the Work is undertaken.
- E. Miscellaneous Site Features: Protect all existing miscellaneous site features from damage by excavating equipment and vehicular traffic, including but not limited to existing structures, fences, mailboxes, sidewalks, paving, and curbs.
- F. Repair and Replacement:
1. Damaged items, including but not restricted to those noted above, shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of work of this contract.
 2. Any damage to existing facilities or utilities to remain as caused by the Contractor's operations shall be repaired at the Contractor's expense.

3.5 LIMITS

- A. As follows, but not to extend beyond Limits of Disturbance as shown on the plans:
1. Excavation: 5 feet beyond top of cut slopes.
 2. Trench Excavation: 6 feet from trench centerline, regardless of actual trench width.
 3. Fill:
 - a. Clearing and Grubbing: 5 feet beyond toe of permanent fill.
 - b. Stripping: 2 feet beyond toe of permanent fill.
 4. Structures: 15 feet outside of new structures.
 5. Roadways: Clearing, grubbing, scalping, and stripping 5 feet from roadway shoulders.
 6. Other Areas: As shown.
- B. Remove rubbish, trash, and junk from entire area within the Limits of Disturbance as material is generated. Stockpiling shall not be permitted without written approval of Owner.

3.6 CLEARING AND GRUBBING

- A. Clear and grub areas within limits shown in approved Clearing, Grubbing, and Stripping Plan.
- B. Except in areas to be excavated, all holes resulting from the clearing and grubbing operations shall be backfilled and compacted in accordance with the applicable sections of these Specifications.

C. Clearing:

1. Remove trees, saplings, snags, stumps, shrubs, brush, vines, grasses, weeds, and other vegetative growth within the clearing limits shown in the Drawings, except those trees and shrubs noted to remain in the Drawings or as directed by the Engineer.
2. Clearing shall be performed in such a manner as to remove all evidence of the presence of vegetative growth from the surface of the project site and shall be inclusive of sticks and branches of thickness or diameter greater than 3/8-inch and of grasses, weeds, exceeding 12 inches in height except as otherwise indicated.
3. Clear undergrowth and deadwood, without disturbing subsoil.

D. Grubbing: Clear areas required for access to site and execution of Work and remove all stumps, root wads, and roots over 1-inch diameter to the following depths:

- | | |
|---|-----------|
| 1. Future Structures and Building Areas | 24 Inches |
| 2. Roads and Parking Areas | 18 Inches |
| 3. All other Areas | 12 Inches |

3.7 TREE REMOVAL

- A. Exercise care in cutting, felling, trimming, and handling of those trees shown for removal to prevent damage to neighboring trees and structures to remain.
- B. Tree Salvage: As shown on the Plans.
- C. No trees may be removed unless approved and permitted by the Engineer.
- D. Do not top trees unless otherwise specified or approved by Owner in writing.

3.8 REMOVAL AND DISPOSAL

- A. Native vegetation may be mulched and used on Site.
- B. Asphalt and Gravel Surfaces:
 1. Asphalt, concrete, and gravel surfaces designated for removal shall be done to full depth.
 2. Asphalt, concrete, and gravel removed at Site may be reused at Site where shown in the Drawings or following approval of the Engineer.
 3. Haul removed asphalt, concrete, and gravel which is unsuitable for reuse or that exceeds quantity required.
- C. Remove debris, rock, abandoned piping, and extracted plant life from Site.
- D. Remove from the Site all debris, materials, equipment, and items found thereon and materials and debris resulting from the Work, except as otherwise indicated.
 1. All existing improvements designated on the Drawings or specified to be removed including but not limited to structures, pipelines, walls, footings, foundations, slabs, pavements, curbs, fencing, and similar structures occurring above, at, or below existing ground surface shall be included in the Work.
 2. Unless otherwise specified, any resulting voids shall be thoroughly cracked out for drainage and backfilled with suitable excavated or imported material compacted to the density of the adjacent soil.
- E. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- F. Do not burn or bury materials on site. Leave site in clean condition.
- G. Removal: All material resulting from demolition, clearing and grubbing, and trimming operations shall be removed from the Site and disposed of in a lawful manner. Materials placed on property of private property owners shall be by written permission only.
- H. Cleanup: During and upon completion of work, promptly remove all unused tools and equipment, surplus materials, and debris.

- I. Adjacent areas shall be returned to their existing condition prior to the start of Work.

3.9 CLEANUP

- A. During the time Work is in progress, make every effort to maintain the Site in a neat and orderly condition.
- B. All refuse, broken pipe, excess fill material, cribbing, and debris shall be removed as soon as practicable.
- C. Should the Work not be maintained in a satisfactory condition, the Owner may cause the work to stop until the cleanup of the Work has been done to the satisfaction of the Engineer.
- D. The Work will not be considered complete or the final payment certificate issued until all rubbish, unused material, or equipment shall have been removed and the premises left in a condition satisfactory to the Owner and the Engineer.

END OF SECTION

SECTION 31 22 13
ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes rough grading and filling associated with contouring of Site in preparation for building excavation and subsequent site work.
- B. Section Includes:
 - 1. Excavating topsoil
 - 2. Excavating subsoil
 - 3. Cutting, grading, filling, and rough contouring of Site

1.2 RELATED SECTIONS:

- A. Section 31 05 13 - Soils for Earthwork
- B. Section 31 05 16 - Aggregates for Earthwork
- C. Section 31 10 00 - Site Clearing
- D. Section 31 23 16 - Excavation
- E. Section 31 23 18 - Rock Removal
- F. Section 31 23 23 - Fill

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
 - 2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
- B. ASTM International (ASTM):
 - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
 - 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
 - 3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 - 4. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
 - 5. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head)
 - 6. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - 7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.4 SUBMITTALS

- A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.
- B. Soils for Earthwork: As specified in Section 31 05 13, Soils for Earthwork.
- C. Aggregates for Earthwork: As specified in Section 31 05 16, Aggregates for Earthwork.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Subsoil Fill: Type **S1 and S2** as specified in Section 31 05 13, Soils for Earthwork.
- B. Structural Fill: Structural Fill as specified in Section 31 05 16, Aggregates for Earthwork.
- C. Granular Fill: Filter material as specified in Section 31 05 16, Aggregates for Earthwork.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify survey benchmark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

- A. Call Local Utility Line Information service at 811 not less than 3 working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
 - 2. Notify Engineer of any potential conflicts resulting from utility locations and the Drawings.
 - 3. Notify utility company to remove and relocate utilities, as may be necessary.
- B. Identify required lines, levels, contours, and datum.
- C. See Section 31 10 00, Site Clearing for additional requirements in protection of existing utilities, survey control, plant life, and landscaped areas in coordination with the Work of this Section.

3.3 TOPSOIL EXCAVATION

- A. Excavate and stockpile topsoil as specified in Section 31 05 13, Soils for Earthwork.

3.4 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded as shown in the Drawings.
- B. When practical, do not excavate wet subsoil. When wet subsoil must be excavated and is to be reused on site for the Work, process wet material to obtain optimum moisture content.
- C. Stockpile excavated material in area designated onsite in accordance with Section 31 05 13, Soils for Earthwork.
- D. When excavating through roots, perform Work by hand and cut roots with sharp axe.
- E. Benching Slopes: Horizontally bench existing slopes greater than 1:2 to key placed fill material to slope to provide firm bearing.
- F. Stability: Replace damaged or displaced subsoil as specified for fill.

3.5 FILLING

- A. General:
 - 1. Grading and filling operations shall not take place when weather conditions and moisture content of fill materials prevent the attainment of specified density.
 - 2. Vertical curves or roundings at abrupt changes in slope shall be established as approved by Engineer.
 - 3. Bring all graded areas to a relatively smooth, even grade and slope by blading or dragging. Remove high spots and fill depressions.
- B. Fill areas to contours and elevations shown in the Drawings with unfrozen materials.

- C. Topsoil Fill:
 - 1. Place topsoil fill in accordance with Section 32 91 13 – High Altitude Soil Preparation.
- D. Place material in continuous layers as follows:
 - 1. Subsoil Fill: Maximum 8 inches compacted depth.
 - 2. Structural Fill: Maximum 12 inches compacted depth.
 - 3. Granular Fill: Maximum 12 inches compacted depth.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Slope grade away from buildings minimum 2 1/2 in first 10 feet in hardscaped areas and 6 inches in first 10 feet in landscaped areas, unless noted otherwise.
- G. Make grade changes gradual. Blend slope into level areas.
- H. Repair or replace items indicated in the Drawings to remain which are damaged by excavation or filling. All costs shall be borne by the Contractor.

3.6 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 0.1 foot from required elevation.

3.7 FIELD QUALITY CONTROL

- A. Perform laboratory material tests in accordance with section 31 05 16.
- B. Perform in place compaction tests in accordance with the following:
 - 1. Density Tests: ASTM D2922
 - 2. Moisture Tests: ASTM D3017
- C. Frequency and location of testing is dependent upon type of material placed. See Section 31 05 13 and 31 05 16, Quality Control Subsections for testing requirements.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest at the sole expense of the Contractor.

END OF SECTION

SECTION 31 23 16

EXCAVATION

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes excavation required for building foundations, site structures, or under slabs-on-grade or paving.
- B. Section Includes:
 - 1. Excavating for building foundations
 - 2. Excavating for paving, roads, and parking areas
 - 3. Excavating for slabs-on-grade
 - 4. Excavating for site structures
 - 5. Excavating for landscaping

1.2 RELATED SECTIONS

- A. Instructions: Edit the following paragraph to fit your project.
- B. Section 01 45 00 - Quality Control
- C. Section 02 41 00 - Demolition
- D. Section 31 05 13 - Soils for Earthwork
- E. Section 31 05 16 - Aggregates for Earthwork
- F. Section 31 10 00 - Site Clearing
- G. Section 31 22 13 - Rough Grading
- H. Section 31 23 18 - Rock Removal
- I. Section 31 23 19 - Dewatering
- J. Section 31 23 23 - Fill
- K. Supplemental Information: Geotechnical report available from Owner upon request.

1.3 DEFINITIONS

- A. Common Excavation: All excavation required for Work, regardless of the type, character, composition, or condition of the material encountered. Common Excavation shall further include all debris, junk, broken concrete, and all other material. All excavation shall be classified as Common Excavation, unless provided as Rock Removal under Section 31 23 18.
- B. Common Material: All soils, aggregate, debris, junk, broken concrete, and miscellaneous material encountered in Common Excavation, excluding rock as defined below.
- C. Concrete Excavation: The removal of pieces of concrete larger than 1 cubic yard in volume that requires drilling, splitting and breaking methods, or a necessitating a trench width increase of 18 inches or more than the width of the preceding 10 feet of trench. Concrete excavation includes materials composed of Portland cement that are not identified other than manholes, structures, sewer pipe, or other appurtenances.
- D. Exploratory Excavation: The removal and replacement of material from locations shown on the Drawings, or as directed for the purpose of investigating underground conditions and identifying potential utility conflict between existing and proposed utilities.
- E. Overbreak: Material beyond and outside of the slope limits established by the Owner's Representative, which becomes displaced or loosened during excavation and is excavated.

- F. Pothole Excavation: Pothole excavation is the removal and replacement of all materials via coring, vacuum extraction, or similar method, not classified as exploratory excavation, for the purposes of locating an underground utility and to investigate underground conditions.
- G. Rock Removal: As defined in Section 31 23 18, Rock Removal.
- H. Spoils: Excavated materials from Site unsuitable for use as fill or not required for backfill and grading.
- I. Unsuitable Materials: See Spoils.

1.4 REFERENCES

- A. Local utility standards when working within 24 inches of utility lines.
- B. Colorado Department of Transportation (CDOT):
 - 1. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the **Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction**. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.5 SUBMITTALS

- A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.

1.6 QUALITY ASSURANCE

- A. Allowable Tolerances: Final grades shall be plus or minus 0.1-foot.
- B. Provide adequate survey control to avoid unauthorized over-excavation.
- C. Weather Limitations:
 - 1. Material excavated when frozen or when air temperature is less than 32 degrees Fahrenheit (F) shall not be used as fill or backfill until material completely thaws.
 - 2. Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently for proper compaction.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 PREPARATION

- A. Prior to commencing work in this Section, become familiar with site conditions. In the event discrepancies are found, notify the Engineer as to the nature and extent of the differing conditions.
- B. Call Local Utility Line Information service at 811 not less than 3 working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
 - 2. Coordinate with and notify utility companies should it be necessary to remove or relocate facilities.
- C. Identify required lines, levels, contours, and datum.
- D. See Section 31 10 00, Site Clearing for additional requirements in protection of existing utilities, survey control, plant life, and landscaped areas in coordination with Work in this Section.

3.2 SITE CONDITIONS

- A. Quantity Survey: The Contractor shall be responsible for calculations for quantities and volume of cut and fill from existing site grades to finish grades established under this contract as indicated in the Drawings or specified and shall include the cost for all earthwork in the total basic bid.
- B. Dust Control: Must meet all federal, state, and local requirements. Protect persons and property from damage and discomfort caused by dust. Water surfaces as necessary and when directed by Engineer to quell dust.
- C. Soil Control: Soil shall not be permitted to accumulate on surrounding streets or sidewalks nor to be washed into sewers, dry wells, or drainageways.

3.3 EXISTING UNDERGROUND UTILITIES

- A. Protect active utilities encountered, located or otherwise, and notify persons or agencies owning same.
- B. Remove inactive or abandoned utilities from within the project grading limits as shown on the plans.

3.4 PRESERVATION OF EXISTING IMPROVEMENTS

- A. Protect adjacent existing structures which may be damaged by excavation work.
 - 1. Conduct operations in such a manner that existing street facilities, utilities, railroad tracks, structures, and other improvements, which are to remain in place, will not be damaged. Furnish and install cribbing and shoring or whatever means necessary to support material around existing facilities, or to support the facilities themselves, and maintain such supports until no longer needed.
 - 2. Open slopes shall not be cut within 5 feet of any existing spread footings unless approved by the Engineer.
 - 3. Do not interfere with 45 degree bearing splay of foundations unless approved by the Engineer
 - 4. Excavated material shall not be placed adjacent to existing or proposed structures.

3.5 EXCAVATION

- A. General:
 - 1. Method of excavation shall be the Contractor's option, but care shall be exercised as final grade is approached to leave it in undisturbed condition.
 - 2. If the final grade for supporting structures is disturbed, it shall be restored to requirements of these Specifications and satisfaction of the Engineer at no additional cost to Owner.
 - 3. The Contractor is advised that footings should be poured as soon as possible to minimize unfavorable final grade conditions from developing.
 - 4. Provide all measures to ensure public safety.
- B. Control of Water:
 - 1. Provide and maintain equipment to remove and dispose of water during the course of the work of this Section and keep excavations dry and free of frost or ice.
 - 2. Bearing surfaces that become softened by water or frost must be re-excavated to solid bearing at Contractor's expense and backfilled with compacted crushed rock at Contractor's expense.
 - 3. Grade top perimeter of excavation to prevent surface water from draining into excavation.
 - 4. See additional requirements in Section 31 23 19, Dewatering.
- C. Frozen Ground: Frost protection shall be provided for all structural excavation work. Foundation work shall not be placed on frozen ground.
- D. Excavate material of every nature and description to the lines and grades as indicated in the Drawings and/or as required for construction of the facility.
 - 1. Allow for forms, shoring, working space, granular base, topsoil, and similar items, wherever applicable.

2. Trim excavations to neat lines. Remove loose matter and lumped subsoil.
- E. Excavated Materials: Soils excavated at Site will be treated and used as one of two general categories of material as provided below.
1. Fill:
 - a. Subsoil Type S1, Select Native Fill, as approved for use by Engineer.
 2. Spoils:
 - a. Ensure there is sufficient suitable material available to complete embankments and other required fillings prior to disposing of any excavated materials.
 - b. Make arrangements for disposal of spoils and include as part of contract work in preparing of project bids.
 - c. Landfill permit or written permission from private property owner to be obtained by the Contractor and provided to the Engineer.
- F. Shoring:
1. The Contractor shall be solely responsible for excavation protection and worker safety and shall provide sheeting and shoring wherever required, all in accordance with current local, state, and federal laws, codes, and ordinances.
 2. Where shoring, sheet piling, sheeting, bracing, lagging, or other supports are necessary to prevent cave-ins or damage to existing structures, it shall be the responsibility of the Contractor to design, furnish, place, maintain, and remove such supports in accordance with applicable ordinances and safety requirements.
 3. The design, planning, installation, and removal of all sheeting accomplished in such a manner as to maintain the undisturbed state of the soil below and adjacent to the excavation.
- G. Slope existing banks with machine to angle of repose or less until shored.
1. Shape, trim, and finish cut slopes to conform to lines, grades, and cross-sections shown, with proper allowance for topsoil or slope protection, where shown.
 2. Protection of excavation side slopes:
 - a. Use excavation methods that will not shatter or loosen excavation slopes.
 - b. Where practical, excavate materials without previous loosening and in limited layers or thickness to avoid breaking the material back of the established slope line.
 - c. Avoid overbreaks. Overbreak is incidental to the Work, except in cases where the Owner's Representative determines that such overbreak was unavoidable.
 - d. Excavation in rock or rocky cuts:
 - 1) Once completed, thoroughly test the slopes with bars or other approved means to remove all loose, detached, broken, or otherwise unstable material.
 - 2) Remove jutting points. Scale slopes using mine scaling rods or other approved methods to remove loose or overhanging materials and provide a safe, trim, neat, and stable condition.
 - 3) Dispose of the materials removed under this subparagraph in the same manner as other excavated material.
 - e. Remove all exposed roots, debris, and all stones more than 3 inches in size which are loose or could become loosened.
 3. Construct slopes free of all exposed roots.
 4. Construct slopes free of unstable rock and loose stones exceeding 3 inches in diameter.
 5. Round tops of cut slopes in soil to not less than a 6-foot radius, provided such rounding does not extend off-site, outside of easements, outside of rights-of-way, or adversely impacts existing facilities, adjacent property, or completed Work.
 6. Trim all surfaces neatly and smoothly.
- H. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 31 23 17, Trenching and Section 31 23 23, Fill.

- I. Notify Engineer of unexpected subsurface conditions.
- J. Over-excavation for Unsuitable Foundation Conditions:
 - 1. Cross-sectional dimensions and depths of excavations shown in the Drawings shall be subject to such changes as may be found necessary by the Engineer to secure foundations free from soft, weathered, shattered, and loose material or other objectionable materials.
 - 2. Unsuitable materials encountered shall be removed and replaced with Structural Fill as specified in Section 31 05 16, Aggregates for Earthwork. All material placed shall be compacted to 95 percent of maximum dry density.
 - 3. Unsuitable materials shall be removed and replaced only as directed in writing by Engineer.
- K. Rock Removal:
 - 1. Remove boulders and rock up to 1/2 cubic yard measured by volume per the requirements of this Section.
 - 2. Remove larger boulders and rock material as specified in Section 31 23 18, Rock Removal.
 - 3. Concrete removal, as defined herein, shall be treated as Rock Removal.
- L. Stockpile excavated material in area(s) designated on or off site in accordance with Section 31 05 13, Soils for Earthwork.

3.6 FIELD QUALITY CONTROL

- A. Perform excavation and controlled fill operations in accordance with the requirements of this Section.
- B. Coordinate the visual inspection and approval of all bearing surfaces by Engineer before installing subsequent work.

3.7 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability and store excavated materials at a distance from top of excavation.
- B. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION

SECTION 31 23 18
ROCK REMOVAL

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes removal of subsurface rock during excavation by mechanical method. The use of explosives for rock removal is not permitting for this project.
- B. Section Includes:
 - 1. Removing identified and discovered rock during excavation.
 - 2. Expansive tools to assist rock removal.
- C. Related Sections:
 - 1. Section 31 22 13 - Rough Grading
 - 2. Section 31 23 16 - Excavation
 - 3. Section 31 23 23 - Fill
 - 4. Section 31 37 00 - Riprap
 - 5. Supplemental Information: Geotechnical report available from Owner upon request.

1.2 DEFINITIONS

- A. Common Excavation: All excavation required for Work, regardless of the type, character, composition, or condition of the material encountered. All excavation shall be classified as Common Excavation, unless provided for under Rock Removal below.
- B. Common Material: All soils, aggregate, debris, junk, broken concrete, and miscellaneous material encountered in Common Excavation, excluding rock as defined below.
- C. Rock: Solid mineral material, including boulders, solid bedrock, or ledge rock, with volume in excess of 1/2 cubic yard or solid material which, by actual demonstration, cannot be reasonably excavated with suitable machinery as defined herein. The Engineer may waive the requirements for actual demonstration if the material encountered is well-defined rock.
- D. Rock Removal: Removal of rock as defined herein by systematic and continuous drilling, hammering, breaking, splitting, or other methods approved by the Engineer.
- E. Suitable Machinery: A track-mounted hydraulic excavator of the 52,800- to 72,500-pound class equipped with a single shank ripper.

1.3 SUBMITTALS

- A. Section 01 30 00 - Submittal Procedures: Submittal procedures.
- B. Equipment: Manufacturer information regarding pound class of machinery proposed for rock removal.
- C. Survey Report: Submit survey report mapping extent and locations of rock encountered, to be used in calculating total volume of rock removal.

1.4 PROJECT CONDITIONS

- A. Conduct survey of rock uncovered in excavation for structures prior to removal of material.

1.5 SCHEDULING – NOT USED

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions and note subsurface irregularities affecting Work of this section.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Engineer Approval for Rock Removal:
 - 1. Prior to commencement of rock removal, expose all material anticipated to be rock by removing the common material above it and then notify the Engineer.
 - 2. The Engineer, in association with the Contractor or the Contractor's representative, will measure the amount of material to be removed in an effort to reach a mutually agreeable volume for anticipated rock removal.
 - 3. Prior to commencing the proposed rock removal, the Contractor must receive written approval by the Engineer stating the approximate volume of excepted rock removal to receive payment.
 - 4. During rock removal activities, should it become apparent the previously agreed upon volume of rock removal will be exceeded, notify the Engineer immediately. Should the Contractor proceed with rock removal in excess of the previously agreed upon volume, the Contractor will do so at their own risk and expense.

3.3 ROCK REMOVAL BY MECHANICAL METHOD

- A. Excavate and remove rock by mechanical method.
 - 1. Use single shank ripper to fracture rock.
 - 2. Drill holes and use expansive tools and wedges to fracture rock.
- B. Cut away rock at bottom of excavation to form level bearing.
- C. Remove shaled layers to provide sound and unshattered base for footings and foundations.
- D. For vaults and other structures, excavate to the depth necessary to install the structure and to a maximum of 18 inches beyond the outside walls of the vault or structure.
- E. Remove excavated materials from site.
- F. Correct unauthorized rock removal associated with structural excavations in accordance with backfilling and compacting requirements of Section 31 23 16, Excavation and as directed by Engineer.
- G. Correct unauthorized rock removal associated with utility work in accordance with backfilling and compacting requirements and as directed by Engineer.
- H. If material which would be classified as rock as defined herein is mechanically removed with equipment of a larger size than specified as Suitable Machinery herein, it shall be understood that any added costs for the removal of rock by this method shall be included in the unit price for common excavation and not paid for under this pay item. If material which would be classified as rock as defined herein is mechanically removed without hammering, breaking, or splitting, it will be considered common excavation and not paid for under this pay item. If equipment larger than the suitable machinery as defined herein is brought on the project site for the sole purpose of rock removal without hammering, breaking or splitting, then such excavation will be considered rock removal.

3.4 FIELD QUALITY CONTROL – NOT USED

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes temporary dewatering and surface water control systems for open excavations and utility trenches.
- B. Section includes:
 - 1. Dewatering systems.
 - 2. Surface water control systems.
 - 3. System operation and maintenance.
 - 4. Water disposal.

1.2 RELATED SECTIONS

- A. Section 02 30 00 - Subsurface Investigations
- B. Section 31 05 16 - Aggregates for Earthwork
- C. Section 31 23 16 - Excavation

1.3 SUBMITTALS

- A. Dewatering Plan:
 - 1. Descriptions of proposed groundwater and surface water control facilities including, but not limited to, equipment; methods; standby equipment and power supply; pollution control facilities; discharge locations to be utilized; and provisions for immediate temporary water supply as required by this Section.
 - 2. Plan to be reviewed by the Engineer prior to the beginning of construction activities requiring dewatering. Review by the Engineer of the design shall not be construed as a detailed analysis of the adequacy of the dewatering system, nor shall any provisions of the above requirements be construed as relieving the Contractor of its overall responsibility and liability for the work.

1.4 DEFINITIONS

- A. Dewatering includes the following:
 - 1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering excavations, trenches, tunnels, and /or shafts.
 - 2. Reducing piezometric pressure within strata to prevent failure or heaving of excavations, trenches, tunnels, and /or shafts.
 - 3. Disposing of removed water.
- B. Surface Water Control: Removal of surface water within open excavations.

1.5 QUALITY CONTROL

- A. All dewatering operations shall be adequate to ensure the integrity of the finished project and shall be the responsibility of the Contractor.
- B. Provide all labor, materials, and equipment necessary to dewater trench and structure excavations, in accordance with the requirements of the Contract Documents.
- C. Secure all necessary permits to complete the requirements of this Section including but not limited to a Colorado Department of Health and Environment (CDPHE) construction dewatering permit.
- D. Control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.

- E. Where the critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement which may develop.
 - 1. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the Contractor.
 - 2. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor.

PART 2 PRODUCTS

2.1 EQUIPMENT

Dewatering, where required, may include the use of well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standby pumping equipment shall be maintained on the jobsite.

PART 3 EXECUTION

3.1 DEWATERING

- A. Provide all equipment necessary for dewatering.
 - 1. Have on hand, at all times, sufficient pumping equipment and machinery in good working condition.
 - 2. Have available, at all times, competent workers for the operation of the pumping equipment.
 - 3. Adequate standby equipment shall be kept available at all times to ensure efficient dewatering and maintenance of dewatering operation during power failure.
- B. Dewatering for structures and pipelines shall commence when groundwater is first encountered and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.
- C. Site Grading:
 - 1. At all times, site grading shall promote drainage.
 - 2. Surface runoff shall be diverted from excavations.
 - 3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.
- D. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
- E. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock.
- F. Maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.
- G. Flotation shall be prevented by maintaining a positive and continuous removal of water. The Contractor shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.
- H. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.
- I. Dispose of water from the work in a suitable manner without damage to the environment or adjacent property. No water shall be drained into work built or under construction without prior consent of the Engineer. Water shall be filtered using an approved method to remove sand and fine sized soil particles before disposal into any drainage system.

- J. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.
- K. Dewatering of trenches and other excavations shall be considered as incidental to the construction of the work and all costs thereof shall be included in the various contract prices in the bid forms.

END OF SECTION

SECTION 31 23 23

FILL

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes backfilling required at building perimeter and site structures to subgrade elevations, fill under interior and exterior slabs-on-grade or pavement, and fill under landscaped areas.
- B. Section includes:
 - 1. Backfilling building perimeter to subgrade elevations.
 - 2. Backfilling site structures to subgrade elevations.
 - 3. Fill under slabs-on-grade.
 - 4. Fill under paving.
 - 5. Fill for over-excavation.

1.2 RELATED SECTIONS

- A. Instructions: Edit the following paragraph per project requirements.
- B. Section 31 05 13 - Soils for Earthwork
- C. Section 31 05 16 - Aggregates for Earthwork
- D. Section 31 22 13 - Rough Grading
- E. Section 31 23 16 - Excavation
- F. Section 31 37 00 - Riprap
- G. Supplemental Information: Geotechnical report available from Owner upon request.

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. Instructions: Select only one AASHTO standard based upon input/standards of client. If no preference is standard, Murraysmith standard is T99.
 - 2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International (ASTM):
 - 1. ASTM C403 - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
 - 2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - 3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
- C. Colorado Department of Transportation (CDOT):
 - 1. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.4 DEFINITIONS

- A. Controlled Low Strength Material (CLSM): Also referred to as Flow-Fill elsewhere in these Specifications. A self-compacted, cementitious material. See Standard Specifications section 206.
- B. Imported Material: Materials obtained from sources offsite, suitable for specified use.
- C. Lift: Loose (uncompacted) layer of material.
- D. Optimum Moisture Content:
 - 1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.
 - 2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

1.5 SUBMITTALS

- A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.
- B. Imported Materials:
 - 1. Materials Source: Submit name and location of imported fill materials suppliers.
 - 2. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
 - 3. Submit results of aggregate sieve analysis and standard proctor test for granular material.
- C. Flow-Fill: Mix designs in accordance with Standard Specifications section 206.

1.6 QUALITY ASSURANCE

- A. Subsoil and topsoil fill materials: In accordance with Quality Assurance requirements stated in Section 31 05 13, Soils for Earthwork.
- B. Aggregate fill materials: In accordance with Quality Assurance requirements stated in Section 31 05 16, Aggregates for Earthwork.
- C. Allowable Tolerances: Final grades shall be plus or minus 0.1-foot.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Subsoil Fill: Type S2, Imported Fill Material, as specified in Section 31 05 13, Soils for Earthwork.
- B. Imported Granular Fill: Coarse Aggregate Material, with classification as shown in the Drawings and specified in Section 31 05 16, Aggregates for Earthwork.
- C. Drain Rock: Filter material as specified in Section 31 05 16, Aggregates for Earthwork.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to Work in this Section, become familiar with Site conditions. In the event discrepancies are found, notify Engineer as to the nature and extent of the differing conditions.
- B. Verify sub-drainage, damp-proofing, or waterproofing installation has been inspected.
- C. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 SITE CONDITIONS

- A. Quantity Survey: The Contractor shall be responsible for calculations for quantities and volume of cut and fill from existing site grades to finish grades established under this contract as indicated in the Drawings or specified and shall include the cost for all earthwork in the total basic bid.
- B. Dust Control: Must meet all federal, state, and local requirements. Protect persons and property from damage and discomfort caused by dust. Water surfaces as necessary and when directed by Engineer to quell dust.

- C. Soil Control: Soil shall not be permitted to accumulate on surrounding streets or sidewalks nor to be washed into sewers.

3.3 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Control of Water:
 - 1. Excavated areas shall be kept free of water and frost.
 - 2. Bearing surfaces which become softened by water or frost shall be re-excavated to solid bearing at Contractor's expense and backfilled with compacted crushed rock at Contractor's expense.
 - 3. See Section 31 23 19, Dewatering for additional details.
- C. Compact subgrade to density requirements for subsequent backfill materials.
- D. Cut out soft areas of subgrade not capable of compaction in place and replace with specified granular fill material. See Article 3.5, Over-excavation for Unsuitable Foundation Conditions in Section 31 23 16, Excavation for additional details.
- E. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.
- F. Subgrade to be approved by Engineer prior to placement of structures and commencement of backfill activities.
- G. Do not allow or cause any work performed or installed to be covered up or enclosed prior to required tests and approvals. Should any Work be enclosed or covered up, uncover at Contractor's expense.

3.4 BACKFILLING

- A. Backfill areas to contours and elevations shown in the Drawings with unfrozen materials.
- B. Do not place materials when weather conditions and/or moisture content prevent attainment of specified density.
- C. Maintain optimum moisture content of backfill materials to attain required compaction density.
- D. Employ placement method that does not disturb or damage other work.
- E. Mechanical tampers permitted in confined areas.
- F. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- G. Foundation Base for Structures:
 - 1. Bring excavation to required subgrade elevation shown in the Drawings.
 - 2. Place foundation base material to required grade shown in the Drawings.
 - 3. Place foundation base material in 6-inch lifts and compact to 95 percent maximum dry density.
- H. Backfill for Structures:
 - 1. Prior to placing backfill, remove forms, temporary construction, and debris below grade.
 - 2. Backfill shall not be placed against poured concrete until 28 days have passed from completion of original concrete pour, unless otherwise approved by Engineer.
 - 3. Heavy compactors and large pieces of construction equipment shall be kept away from any embedded wall a distance of at least 5 feet in order to avoid the build-up of excessive lateral pressures.
 - a. Over-compaction of fill near walls should be avoided.
 - 4. Compaction within 5 feet of the walls shall be accomplished using hand-operated vibratory plate compactors or tamping units.

5. The maximum particle size of granular material placed against buried structures shall be limited to no greater than 1-1/2-inch diameter.
6. Structural fill backfill material shall be brought up on all sides of the walls and footings in such a manner as to avoid adverse differential lateral earth pressures on the vertical surfaces.
7. Appropriate lift thickness will depend on the type of compaction equipment used and the type of material being placed. All material shall be compacted to at least 95 percent of the standard maximum dry density.
 - a. For moderate- to heavy-weight compactors, a maximum loose lift thickness of 12 inches shall be used.
 - b. For hand-operated or small compactors, a maximum loose lift thickness of 8 inches shall be used.
8. Particular care must be taken to avoid damage to the pipe connections to the structure.
9. Utility trench backfill within 10 feet of all structural perimeters shall meet the requirements for structural fill.
- I. For areas receiving surface structures or existing paved areas to be constructed or replaced, such as parking lots, and sidewalks:
 1. Place fill material in accordance with Section 31 05 16, Aggregates for Earthwork.
- J. Slope grade away from building minimum 2 1/2 in first 10 feet in hardscaped areas and 6 inches in first 10 feet in landscaped areas, unless noted.
- K. Make gradual grade changes. Blend slope into level areas.
- L. Remove surplus backfill materials from Site in accordance with Section 31 23 16, Excavation.

3.5 FIELD QUALITY CONTROL

- A. All testing and reporting shall be conducted and completed by an independent laboratory provided by the Owner. Initial testing will be paid for by the Owner. Subsequent testing after failure of initial acceptance testing shall be paid by the Contractor.
- B. Perform laboratory material tests in accordance with **AASHTO T180**
- C. In-place compaction testing for structural fill material shall be performed at 2-foot elevation increments in the fill material with at a minimum of one test per each 2,500 square feet of material placed. The Engineer shall be provided with the results of each compaction test at the time of testing.
- D. Perform in place compaction tests in accordance with the following:
 1. Density Tests: ASTM D2922.
 2. Moisture Tests: ASTM D3017.
- E. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest at the sole expense of the Contractor.
- F. When testing of subgrade is not possible or feasible as detailed above, proof roll compacted fill surfaces under slabs-on-grade, pavers, paving, and as may be otherwise required by the Engineer.

3.6 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 31 37 00

RIP RAP

PART 1 GENERAL

1.1 SCOPE

- A. This Section consists of furnishing and placing an erosion-resistant cover material for protecting slopes and basins at locations shown or as directed.

1.2 RELATED SECTIONS

- A. Section 31 22 13 – Rough Grading
- B. Section 31 23 18 – Rock Removal

1.3 REFERENCES

- A. Mile High Flood District (MHFD) Construction Specifications

1.4 SUBMITTALS

- A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.
- B. Materials Source: Submit name of imported materials suppliers.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- D. Results of aggregate sieve analysis and standard proctor tests for all granular material.

PART 2 MATERIALS

2.1 RIPRAP

- A. In accordance with material requirements for riprap in section 31 37 00 of the Mile High Flood District Construction Specifications.

PART 3 EXECUTION

3.1 PREPARATION

- A. In accordance with preparation requirements for riprap in section 31 37 00 of the Mile High Flood District Construction Specifications.

3.2 RIPRAP

- A. In accordance with placement requirements for riprap in section 31 37 00 of the Mile High Flood District Construction Specifications.

3.3 MAINTENANCE

- A. Maintain the riprap protection until accepted. Replace any material displaced by any cause at no additional cost to the owner.

END OF SECTION

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes construction of an aggregate subbase and base course for placement under asphalt or concrete paving, unit paving, or placed and left exposed.
- B. Section Includes:
 - 1. Aggregate subbase
 - 2. Aggregate base course

1.2 RELATED REQUIREMENTS:

- A. Section 31 22 13 - Rough Grading
- B. Section 31 23 23 - Fill
- C. Section 31 37 00 - Riprap
- D. Section 31 05 16 - Aggregates for Earthwork

1.3 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications
 - 2. T11, Standard Method of Test for Materials Finer Than 75 μ m (No. 200) Sieve in Mineral Aggregates by Washing
 - 3. T27, Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
 - 4. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
- B. ASTM International (ASTM):
 - 1. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 - 2. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
 - 3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - 4. ASTM D2940 - Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports
 - 5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
- C. Colorado Department of Transportation (CDOT):
 - 1. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the **Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction**. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.4 DEFINITIONS

- A. Completed Course: Compacted, unyielding, free from irregularities and standing water, with smooth, tight, even surface, true to grade, line, and cross-section.
- B. Completed Lift: Compacted with uniform cross-section thickness.

- C. Keystone: Fine aggregate used to aid in binding of loose surface stone.

1.5 SUBMITTALS

- A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 - 1. Submit data for geotextile fabric and herbicide.
- C. Test Reports:
 - 1. Indicate supplier, sieve analysis, optimum moisture content and density in accordance with AASHTO T180 for all subbases and base courses to be incorporated into the work.

1.6 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.

PART 2 PRODUCTS

2.1 AGGREGATE BASE COURSE

- A. Class 6 Aggregate Base Course in accordance with Standard Specifications Section 703.

2.2 SOURCE QUALITY CONTROL

- A. Perform tests necessary to locate acceptable source of materials meeting specified requirements.
- B. Final approval of aggregate material will be based on test results of installed materials.
- C. Should separation of coarse from fine materials occur during processing or stockpiling, immediately change methods of handling materials to correct uniformity in grading.

2.3 EQUIPMENT

- A. Compaction Equipment: Adequate in design and number to provide compaction and to obtain specified density for each layer.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

- A. Obtain Engineer's acceptance of subgrade before placing base course or surfacing material.
- B. Verify compacted substrate is dry and ready to support paving and imposed loads.
 - 1. Proof roll substrate with equipment approved by the Engineer in minimum two perpendicular passes to identify soft spots.
 - 2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23.

3.2 AGGREGATE BASE COURSE

- A. Place aggregate base course to the depth shown on the plans in accordance with section 304 of the standard specifications.

3.3 FIELD QUALITY CONTROL

- A. Quality control testing shall be performed by an independent testing laboratory provided by the Owner.
- B. Refer to table below for minimum sampling and testing requirements for aggregate base course and surfacing. The OWNER reserves the right to complete additional testing.

Property	Test Method	Frequency	Sampling Point
Gradation	AASHTO T11 and AASHTO T27	One sample every 500 tons but at least every 4 hours of production	Roadbed after processing
Moisture Density (Maximum Density)	AASHTO T180	One test for every aggregate grading produced	Production output or stockpile
In-Place Density and Moisture Content	AASHTO T310	One for each 500 ton but at least every 10,000 square feet of area	In-place completed, compacted area

3.4 CLEANING

- A. Remove excess material from the Work area. Clean stockpile and staging areas of all excess aggregate. Restore per Specifications as applicable.

END OF SECTION

SECTION 32 16 10
CONCRETE CURB GUTTER AND SIDEWALK

PART 1 GENERAL

1.1 SCOPE

This section includes the construction of concrete curb, gutter, and sidewalk.

1.2 REFERENCE STANDARDS

- A. References herein to "AASHTO" shall mean Association of American State Highway Transportation Officials.
- B. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the **Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction**. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.3 SUBMITTALS

- A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.
- B. Subbase and Aggregate Base Course: In accordance with Section 32 11 23.
- C. Concrete Mix Design: Submit concrete mix design in accordance with Standard Specifications **Section 601**.
- D. Reinforcing Steel: Submit bar list and diagrams in accordance with Standard Specifications **Section 602**.

1.4 QUALITY ASSURANCE

- A. All testing to determine compliance with the specifications shall be performed by an independent testing laboratory contracted by the Contractor and approved by the Engineer. All testing costs shall be borne by the Contractor.
- B. Sampling and testing of concrete in accordance with Standard Specifications **Section 106.06**.

1.5 PRE-CONCRETE PLACEMENT MEETING

- A. Schedule and attend a Concrete Placement meeting at least 1-week prior to placing concrete.
- B. The meeting shall be attended by the OWNER, ENGINEER, CONTRACTOR, Testing Laboratory Representative, and the Concrete Supplier.
- C. The following shall be discussed at the meeting: Safety, Batching and Delivery, Adjustments to Mix; Site Dosing, Placement Rates and Anticipated Schedule of Placing and Finishing, Site Layout –Holding Area; Pump Truck Location; Truck Wash-out Area; Parking area, Equipment – Pumps and Appurtenances; Vibrators; Spare Equipment, Concrete Testing Procedures, and Curing.

PART 2 PRODUCTS

2.1 AGGREGATE MATERIAL

- A. Aggregate Base for Concrete: Class 6 Aggregate Base Course in accordance with Standard Specifications **Section 703**.

2.2 CONCRETE

- A. Concrete for sidewalks and curb ramps
 - 1. Use Class B concrete in accordance with Standard Specifications **Section 601**.

2. Use reinforcing steel in accordance with Standard Specifications **Section 602**.

PART 3 EXECUTION

3.1 AGGREGATE PAVEMENT BASE

Place pavement base to the depth shown on the plans in accordance with **Section 304** of the Standard Specifications.

3.2 CONCRETE SIDEWALK

Construct concrete sidewalks in accordance with Standard Specifications **Section 608**.

3.3 FIELD QUALITY CONTROL

Field test concrete in accordance with **Section 106.06** of the Standard Specifications.

END OF SECTION

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section specifies cast-in-place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.
- B. Cast-in-place concrete includes the following.
 - 1. Footings and foundations
 - 2. Pavement on grade
 - 3. Foundation walls and pedestals
 - 4. Miscellaneous concrete
 - 5. Seat walls

1.2 QUALITY ASSURANCE

- A. Conform to applicable codes and standards including but not limited to the following except as herein modified:
 - 1. ACI 301 Specifications for Structural Concrete for Buildings ACI 304 Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
 - 2. ACI 305 Hot Weather Concreting.
 - 3. ACI 306 Cold Weather Concreting.
 - 4. ASTM C94 Specification for Ready Mixed Concrete
 - 5. ACI 318 Building Code Requirements for Reinforced Concrete

1.3 TOLERANCES

- A. Flatwork: Tops of footings, piers and pad shall not be out of level more than 1/4" in 10' above or below elevation(s) shown. Slabs, floors, ramps, platforms, aprons, and walks shall not be out of level more than 1/8" in 10' above or below the elevation shown.
- B. Notification: The Contractor shall notify the Owner's Representative a minimum of 48 hours before pouring any footings, walls, or slabs. Concrete shall not be placed until forming, reinforcing, piping, and conduit have been observed and approved by the Owner's Representative.

1.4 SUBMITTALS

- A. Laboratory test reports for concrete materials and mix design tests.

1.5 WARRANTY & GUARANTEE

- A. The Contractor shall warranty all work performed for a period of one year following the date of Initial Acceptance of the work by the Owner.

- B. Repairs made during the warranty period shall be done in a manner acceptable to the Owner and at the Contractor's expense.

PART 2 - PRODUCTS

2.1 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Supports for Reinforcement: Bolsters, chair spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire-bar-type supports complying with CRSI specifications.

2.2 CONCRETE MIXES

- A. Basic Concrete Mix Requirements: Final proportioning used to obtain the specified strengths shall not be less than the minimum or greater than the maximum requirements specified in the following table:

Compressive Strength at 28 days	Slump	Air Content (%)
4,500 psi	2-4"	5-8%

PART 3 - EXECUTION

3.1 CONCRETE MIXING AND DELIVERY

- A. Concrete used for walks shall contain at least 6.0 sacks of cement per cubic yard and 5-8% entrained air.
- B. Deliver concrete to the job and discharge entire contents within 1 1/2 hours, or before drum has turned 300 revolutions, whichever occurs first, after introduction of mixing water. In hot weather, or under conditions contributing to quick set of concrete, shorter times may be required by the Owner's Representative.
- C. Add no water at the job site.
- D. Concrete shall not be placed when temperatures are below 50° F.

3.2 CONCRETE PLACEMENT

- A. Convey, place, and consolidate concrete in compliance with the practices and recommendations of ACI 304, and as herein specified. Provide expansion joints using expansion joint material located as indicated and approved with a maximum of 100 ft. on center. Provide hand tooled or saw cut divider joints, as indicated on plans, a minimum of 1 3/4" deep as indicated for exterior work. If not shown, space joints equal to the width of the walk.
- B. Notify the Owner's Representative not less than eight (8) working hours in advance of any pour and as soon as formwork and reinforcing are substantially complete.

- C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified. Perform concrete placing at such a rate that concrete which is being integrated with fresh concrete is still plastic. Deposit concrete as nearly as practicable to its final location to avoid segregation due to re-handling or flowing.
- D. Do not subject concrete to any procedure which will cause segregation.
- E. Screed concrete which is to receive other construction to the proper level to avoid excessive skimming or grouting.
- F. Do not use concrete which becomes non plastic and unworkable, does not meet the required quality control limits, or which has been contaminated by foreign materials. Do not use re-tempered concrete.
- G. Remove rejected concrete from the project site and dispose of it in an acceptable location.
- H. Isolate flatwork from walls, columns, bollards, and all other vertical elements with expansion joints unless otherwise indicated.
- I. Consolidation: Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI 309, to suit the type of concrete and project conditions. Vibration of forms and reinforcing will not be permitted, unless otherwise accepted by the Owner's Representative.
- J. Bring slab surfaces to the correct level with a straight edge and strike off. Use bull floats or darbies to smooth the surfaces prior to beginning finishing operations.
- K. Maintain reinforcing steel in the proper position continuously during concrete placement operations.
- L. Bonding: Roughen surfaces of set concrete at all joints, except where bonding is obtained by use of a concrete bonding agent, and clean surfaces of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner to expose bonded aggregate uniformly and to not leave laitance, loose particles, aggregate, or damaged concrete at the surface.
- M. Hot Weather Placement: When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305.

3.3 FINISHING

- A. Broom Finishes
 - 1. Nonslip Medium Broom Finish: Apply nonslip broom finish to exterior concrete flatwork platforms, steps, and ramps, and elsewhere as shown on the drawings and details. Use 2" tooled edges on all concrete flatwork edges.
 - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
 - 3. Medium-to-Coarse-Textured Broom Finish: For use on roadways and streets only. Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

4. Immediately after trowel finishing, slightly roughen the concrete surface by brooming in the direction perpendicular to the main traffic route or as indicated on plans. Use fiber bristle broom unless otherwise directed. Coordinate the required final finish with the Owner's Representative before application.
- B. Special Finishes
1. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:
 - a. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
 - b. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
 - c. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
 - d. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
 2. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch.
 - a. Spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
 - b. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
 - c. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
 - d. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
 3. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:
 - a. Uniformly spread [25 lb/100 sq. ft.] [40 lb/100 sq. ft.] [60 lb/100 sq. ft.] of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
 - b. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage and embed by power floating.
 - c. Coordinate curing compounds retained in Part 2 for compatibility with slip-resistive aggregate and, if required, revise lists of manufacturers accordingly. Special curing compounds may be required.
 - d. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
 - e. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.
 4. Rock-Salt Finish: After initial [floating] [troweling] [brooming], uniformly spread rock salt over paving surface at the rate of 5 lb/100 sq. ft.
 - a. Embed rock salt into plastic concrete with [roller] [or] [magnesium float].
 - b. Retain first subparagraph below if polyethylene will not smother other textures previously applied to concrete.
 - c. Cover paving surface with 1-mil- (0.025-mm-) thick polyethylene sheet and remove sheet when concrete has hardened and seven-day curing period has elapsed.

- d. After seven-day curing period, saturate concrete with water and broom-sweep surface to dissolve remaining rock salt, thereby leaving pits and holes.
- 5. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to paving surface according to manufacturer's written instructions and as follows:
 - a. Option for rate of application in first subparagraph below is usually recommended for light traffic. Consult manufacturers and revise rate of application if required.
 - b. Uniformly spread dry-shake hardener at a rate of [100 lb/100 sq. ft.] unless greater amount is recommended by manufacturer to match paving color required.
 - c. Uniformly distribute approximately two-thirds of dry-shake hardener over the concrete surface with mechanical spreader; allow hardener to absorb moisture and embed it by power floating. Follow power floating with a second application of pigmented mineral dry-shake hardener, uniformly distributing remainder of material at right angles to first application to ensure uniform color and embed hardener by final power floating.
 - d. After final power floating, apply a hand-troweled finish followed by a broom finish.
 - e. Coordinate curing compounds retained in Part 2 for compatibility with pigmented mineral dry-shake hardener and, if required, revise list of manufacturers accordingly. Special curing compounds may be required.
 - f. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.

C. Finish walls according to drawings.

3.4 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold and hot temperature. Maintain without drying at a relatively constant temperature for the period necessary for hydration of the cement and proper hardening of the concrete.
- B. Start initial curing as soon as free moisture has disappeared from the concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 72 hours.
- C. Begin final curing procedures immediately following initial curing and before the concrete has dried. Continue final curing for at least 7 days and in accordance with ACI 301 procedures. Avoid rapid drying at the end of the final curing period.
- D. Curing Methods: Provide white pigmented liquid membrane curing as follows: Apply the specified membrane forming curing compound to damp concrete surfaces as soon as the water film has disappeared. Apply uniformly by spray equipment in accordance with the manufacturer's directions. Maintain the continuity of the coating and repair damage to the coat during the entire curing period.

3.5 TESTING

- A. Concrete materials and operations will be tested and inspected as work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Owner's Representative for Initial or Final Acceptance.
- B. Tolerances: Slabs and finished surfaces shall be in a plane, pitched and sloped as shown on the drawings within a finish tolerance 1/4" in 10' for concrete. Pockets on slabs and finished surfaces which hold water after construction will be cause for rejection of the slab.

- C. Layout Lines and Levels: Before paving or forming operations commence, the site shall be substantially staked out for the work of this section for the Owner's Representative's approval.

3.6 EVALUATION OF CONCRETE STRENGTH

- A. Strengths of concrete shall be considered satisfactory if the average of any three consecutive strength tests of the laboratory cured specimens representing each specified strength of concrete is equal to or greater than the specified strength, or if test cylinders taken are equal to or greater than the specified strength.
- B. Concrete Compressive Strength: If the concrete fails to meet the compressive strength requirements, additional curing may be required, and modifications may be required in the concrete mix design for the remaining concrete work. Replace concrete already in place that fails to meet strength requirements.

END OF SECTION 321313

SECTION 321812 - CRUSHER FINE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work shall include construction of areas made of crusher fines: decomposed granite (grey color) and crushed 1/4" minus granite aggregate (grey color) with stabilizer binder additive as indicated on the plans. The work shall include the provision of labor, equipment, and supplemental materials necessary to complete the work as required on the plans and in these specifications.
- B. Grey Breeze, available from Pioneer Landscape Centers: 866.600.0652, www.pioneersand.com or approved equal.

1.2 SUBMITTALS

- A. Submit copies of crusher fines mix design, including source to owner prior to commencement of work.
- B. Submit a sample of the crusher fines to the landscape architect (5 lb. sample) for approval prior to commencement of work.

PART 2 - MATERIALS

2.1 PRODUCTS

- A. Materials and equipment: As selected by the Contractor, except as indicated.
- B. Crusher Fines shall be tan in color. Contractor to submit sample for approval to Owner's Representative.
- C. Stabilizer Binder
 - 1. Patented, nontoxic, organic binder that is a colorless and odorless concentrated powder that binds crusher fines together to produce a firm surface.
 - 2. Provided by Stabilizer Solutions, Inc., 1-800-336-2468

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

- A. Crusher fines shall be stockpiled at designated sites as approved by the Project Coordinator to minimize disturbances to existing vegetation and maintain trail and facility access. Care should be taken to not mix crusher fines with soil. Materials that are mixed with soil will not be acceptable and shall be removed from the site immediately.
- B. Do not install crusher fines during rainy conditions.

3.2 BASE PREPARATION

- A. Clear plant material from areas to be surfaced with crusher fines.
- B. Place and compact small quantities of fill to eliminate low spots in crusher fine areas and correct minor drainage problems. Where drainage patterns require, coordinate with Project Manager, and install CMP pipe sized to accommodate drainage and extending 3' beyond path edge to each side to insure proper site drainage.
- C. Excavate existing material to the lines, grade, and depth as designated on the plans. Do not over excavate a wider section than necessary to provide the minimum area. Deposit spoils alongside unless otherwise noted.

3.3 INSTALLATION

- A. Crusher Fines - Refer to drawings for additional installation details and cross section.
- B. Blend 12-16 lbs. of stabilizer per ton of crusher fines. It is critical that stabilizer be thoroughly and uniformly mixed throughout crusher fines.
- C. Upon thorough moisture penetration, compact aggregate screenings to 95% relative compaction by compaction equipment such as double drum roller (2-4) ton or single drum roller (1000 lbs.) vibratory plate tamp. Do not begin compaction for 6 hours after placement and up to 48 hours.
- D. Take care in compacting crusher fines when adjacent to planting and irrigation systems.

3.4 TESTING

- A. Perform gradation of crusher fines in accordance with ASTM C 136 – Method for Sieve Analysis for Fine and Course.

3.5 CLEANING

- A. General: Upon completion of site preparation work, or portion thereof, clean areas worked on each day, remove debris, tools, and equipment. Maintain the site clear and clean, and free of materials and debris and suitable for the unobstructed site work operations. Daily removal of mud and debris, including excess crusher fines materials shall be the responsibility of the Contractor.
- B. No separate payment will be made for cleaning and all costs connected therein shall be considered incidental to the contract.
- C. Provide Owner's representative with the following excess materials for use in future crusher fines paving repair: (40) - 50 lb. bags of the crusher fines and (1) 50 lb. bag of the stabilizer additive.

3.6 PROTECTION

- A. The Contractor shall be responsible for making a reasonable effort to protect the work from vandalism. If barricading or signage is necessary, the Contractor may request assistance

from Owner, if barricade materials are available. Any vandalism shall be brought to the attention of the Owner.

END OF SECTION

SECTION 329000 - GENERAL LANDSCAPE

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all trees, shrubs, and other plant materials, labor equipment, and non-plant materials required to complete installation of planting indicated on the landscape drawings and details. Furnish all soil preparation, fertilizer, soil mulching, trees, shrubs, groundcovers, sodding, bed mulching, labor and equipment required to landscape all areas as indicated on the landscape drawings.
- B. Work in this Section includes, installation of trees, shrubs, perennials, annuals, ornamental grasses, installation of mulch materials and mitigation of areas damaged by construction activities performed under this contract.
- C. Section Includes
 - 1. Installation of trees, shrubs, ornamental grasses, perennials, annuals, installation of mulch materials and mitigation of areas damaged by construction activities performed under this contract.
- D. Owner Furnished Items
 - 1. None
- E. Permits
 - 1. Contractor is responsible for obtaining all necessary permits required for installation of landscape and irrigation.
 - 2. Contractor shall know, understand, and comply with all watering restrictions.
 - 3. Permits may be necessary if restrictions are in effect.

1.2 REFERENCES

- A. Refer to Drawings
- B. Refer to the Agreement between the Contractor and Owner
- C. Refer to Section on Fine Grading and Soil Preparation
- D. Refer to Section on Sodding
- E. Refer to Section on Seeding

1.3 DEFINITIONS

- A. Subgrade: The final elevation of material supporting additional material above it.
- B. Finished Grade: The final elevation of the upper most surface material. Sod shall be top of thatch layer.

1.4 SUBMITTALS

- A. See Section 01 3000 – Administrative Requirements for submittal procedures.
- B. Product Data: Submit product data sheets for each of the following items. Submittals must be made prior to commencing any site work.
 - 1. Compost
 - 2. Wetland Seed Mix
 - 3. Turfgrass/Sod
 - 4. Crusher Fines
 - 5. Rock Mulch
 - 6. Wood Mulch
 - 7. Boulder
 - 8. Metal Edger
 - 9. Tree Staking and Guying System
 - 10. Tree Wrap
 - 11. Bench
 - 12. Receptacle
 - 13. Bike Rack
 - 14. Pet Pickup Station
 - 15. Picnic Tables
 - 16. Pedestrian Bollard
- C. Samples: Submit physical samples of each of the following materials for approval. All samples shall be submitted in a one-quart, clear, zip-top plastic bag, or appropriate container. Submittals must be made prior to commencing any site work. All samples shall be clearly labeled with the following information.
 - 1. Project Name
 - 2. Material name as shown on plans and specifications
 - 3. Supplier or distributor's name
 - 4. Supplier or distributor's product name and order number
 - 5. Required samples are as follows:
 - a. Compost
 - b. Crusher Fines
 - c. Road Base
 - d. Plastic Edger
 - e. Rock Mulch
 - f. Wood Mulch
 - g. Standard and Enhanced Paving – 48" x 48" sample
 - h. Stepping Stones
- D. Supplier list
 - 1. Submit a single list of all material suppliers for plant material, and all related landscape and irrigation materials to complete the work in this section and related sections. List must be submitted prior to commencing any site work.
- E. Construction Schedule
 - 1. Prior to beginning installation of the landscape, the Contractor shall submit a project construction schedule to the General Contractor and Owner for approval. The schedule shall include the areas and types of construction to be undertaken and the sequence which will be used to complete the project. The schedule must be submitted prior to commencement of activities. The schedule shall clearly identify proposed timing for seeding, sodding, and plant material installation.

- F. Certificates for Inspections of Materials
 - 1. All State, Federal, or other inspection certificates shall be submitted to the Landscape Architect prior to acceptance of the plant material along with other information showing the source or origin.
 - 2. Submit current grower or nursery certifications to Landscape Architect indicating that all contractor supplied plant material is healthy, vigorous, and free from insect pests, plant diseases, and injuries.
- G. Contract Closeout Submittals
 - 1. Operation and Maintenance Manuals
 - a. At Final Acceptance, the Contractor shall furnish written maintenance instructions to the Owner's Representative and Owner for maintenance and care of the landscaping. Instructions shall include directions for irrigation, weeding, pruning, fertilization, and spraying, as required to continue proper maintenance through a full growing season and dormant period.
 - b. The Contractor shall furnish an operation manual for all equipment.
- H. Guarantee and Warranty
 - 1. At Initial Acceptance, the Contractor shall furnish written guarantee and warranty to the Owner based on the requirements of this section.

1.5 QUALITY ASSURANCE

- A. Reference Standards
 - 1. U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act and equal in quality to standards for Certified Seed.
 - 2. Requirements for measurements, grading, branching, quality, and the balling and burlapping of plants listed in the plant list shall follow the current issue of American Standard for Nursery Stock issued by the American Association of Nurserymen, Inc., ANSI-Z 60.1, most current version.
 - 3. Plants shall equal or exceed the measurements specified in the plant list, which are minimum acceptable sizes. Plants shall be measured before pruning with branches in normal position. Any necessary pruning shall be done at the time of planting.
- B. Quality of Materials
 - 1. All materials shall be subject to inspection and approval. Prior to Initial Acceptance the Landscape Architect reserves the right to reject the work and all materials at any time or place which in their opinion fails to meet these specification requirements.
 - 2. Inspection is primarily for quality; however, other requirements are not waived even though visual inspection results in approval. Materials may be inspected where growing but inspection at the place of growth shall not preclude the right of rejection at the site. Inspection may be made periodically during installation of materials, at Initial Acceptance, and at Final Acceptance by the Landscape Architect. Plants shall have a habit of growth that is normal for the species. They shall be healthy, vigorous, and free from insect pests, plant diseases, and injuries. All plant material shall be inspected stock conforming to all State and Federal Regulations.
 - 3. Plant material shall not exhibit signs of accelerated growth.
- C. Vandalism
 - 1. The Contractor is not responsible for malicious destruction of plantings after Final Acceptance of the project. The Contractor is, however, responsible for replacement of materials stored but not yet installed, and installed material vandalized prior to Final Acceptance. The Contractor shall promptly report all cases of vandalism to the Owner. The Contractor shall inform the Owner in writing if additional protection must be installed to protect the landscaping from damage after installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping

1. Deliver fertilizer to site in original unopened containers bearing the manufacturer's guaranteed chemical analysis, name, trade name, trademark, and conformance to State law.
2. Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored. Provide copies of delivery receipts for construction materials to the Owner's Representative as the deliveries are made. These construction materials include fertilizers, soil amendments, peat moss, manure, grass seed, plant tabs, and mulches.
3. Plants shall be in containers with limbs bound, properly wrapped, and prepared for shipping in accordance with recognized standard practice. Between the time plants are dug and actual planting the root system shall be kept moist, and plants shall be protected from adverse conditions due to climate and transportation.
4. Each plant shall be identified by means of a grower's label affixed to the plant. The grower's label shall have the data needed to show conformance to specifications. Use durable waterproof labels with water resistant ink which will remain legible for at least 60 days. Notify the Owner's Representative prior to delivery of plant materials to the site so that a pre-planting inspection may be made or indicate delivery schedule in advance so plant material may be inspected upon arrival at job site, whichever is more appropriate.
5. Do not drop plants. Do not lift plants by the trunk, stems, or foliage. The ball of the plant shall be natural, and the plant shall be always handled by the ball. All plants shall be always protected from drying out or other injury. Minor broken and damaged roots shall be pruned before planting.

B. Acceptance at Site

1. Remove unacceptable plant material immediately from job site.
2. Major damage is cause for rejection.
3. No balled or burlapped plant shall be accepted if the ball is broken, if the trunk is loose in the ball, or if trees are handled roughly.

C. Storage and Protection

1. Deliver trees and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than four (4) hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by setting balled stock on ground and cover ball with soil or peat moss.
2. Always keep root balls moist.
3. Protect all existing and newly planted trees, shrubs, and groundcover within the areas of construction and related excavation as herein specified. Provide suitable barricades such as fences as required.

1.7 PROJECT/SITE CONDITIONS

- A. The Contractor must examine the subgrade upon which work is to be performed, verify subgrade elevations, observe the conditions under which work is to be performed, verify suitability of the soil, and notify the Owner's Representative in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the General Contractor. Commencement of work shall mean acceptance of the site conditions.

- B. Existing Conditions
 - 1. The site will be provided to the contractor within ± 0.1 foot of finish grades.
 - 2. Utilities
 - a. Determine location of underground utilities and perform work in a manner which will avoid possible damage. Do not permit heavy equipment such as trucks, rollers, or bulldozers to damage utilities. When necessary, hand excavate to minimize the possibility of damage to underground utilities. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned. Any damage to utilities that may result despite protective measures must be completely corrected and repaired by the Contractor at no additional cost to the Owner.

1.8 SEQUENCING & SCHEDULING

- A. Planting Schedule
 - 1. Schedule each type of required landscape work during the normal season for such work. Establish dates for each type of work and establish a completion date. Correlate work with specified maintenance periods to provide maintenance until Acceptance by the Owner. Do not depart from the accepted schedule, except with written authorization. Submit request to the Owner's Representative for changes in the planting schedule. When delays in the planting schedule are unavoidable, include documentation of the reason for delay.
 - 2. Plant trees and shrubs during normal season based on project location climate.
- B. Coordination With Lawns
 - 1. Plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise authorized by the Owner's Representative. If planting of trees and shrubs occurs after lawn work, protect lawn areas, and promptly repair damage to lawns resulting from planting operations.

1.9 WARRANTY & GUARANTEE

- A. Initial Acceptance consists of a walk-through of the project site by the Landscape Architect resulting in a punch list. Punch list items shall be completed by the Contractor and verified as complete by the Landscape Architect. Following verification, an Initial Acceptance letter may be issued outlining areas accepted, date of acceptance, and noting any outstanding punch list items. Date of Initial Acceptance shall also be the warranty period start date.
- B. Final Acceptance shall consist of a walk-through of the project site by the Landscape Architect resulting in a punch list. Punch list items shall be completed by the Contractor and verified as complete by the Landscape Architect. Following verification, a Final Acceptance letter may be issued outlining areas accepted, date of acceptance, and noting any outstanding punch list items. Final Acceptance walk-through shall be scheduled thirty (30) days prior to the expiration of the warranty period. It is the Contractor's responsibility to contact the Owner's Representative and Owner to schedule Final Acceptance activities.
- C. Warranty trees, shrubs, groundcovers, and all plant material for a period of one year from the date of Initial Acceptance against defects not resulting from neglect of Owner, or abuse and damage by others. Contractor shall document such damage and submit to Owner within seven (7) days.
- D. For a period of one year after Initial Acceptance of work, at no additional cost to the Owner, the Contractor shall replace any plants that are dead, in an unhealthy or unsightly condition, or have lost their natural shape due to dead branches or excessive pruning. Inadequate maintenance by

the Owner shall not be cause for replacement. All replacement planting shall be done within 30 days of punch list issuance.

- E. Replacement plants shall be of the same variety and size or larger as originally specified in the plant list. Plants shall be planted as originally specified. All areas damaged by planting or replacement operations shall be fully restored to their original condition as specified. Remove all dead or defective plant material from the site immediately.
- F. A one-year warranty shall also apply to the plants replaced because of the Initial Acceptance walk-through punch list.

1.10 MAINTENANCE

- A. Begin interim maintenance period immediately after planting of landscape materials and installation of sod areas. Interim maintenance occurs until Initial Acceptance has been issued, at which point the maintenance period begins.
- B. The maintenance period will commence on the date of Initial Acceptance and end at midnight on the date of Final Acceptance or once all warranty items are complete, whichever occurs later. Phased plantings require prior authorization from the Owner, as well as any adjustments to this date. This can be negotiated with the Owner and Owner's Representative after installation has begun.
- C. When the installation Contractor performs the maintenance items required for all landscape areas during the interim maintenance and maintenance periods, Contractor shall be responsible for any warranty items.
- D. When General Contractor or Owner accepts an installation contract that does not include maintenance for all landscape areas for the duration of the interim maintenance and maintenance periods or hires a separate Contractor to perform maintenance during the interim maintenance and/or maintenance period, the installation warranty shall be thirty (30) days for the installation Contractor commencing from the date of Initial Acceptance.
- E. Review maintenance requirements of the project with the Owner prior to Final Acceptance, and prior to the termination of the maintenance period. Information conveyed to the Owner shall be consistent with the maintenance instructions provided by the Contractor as part of the contract close out submittals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Mulch
 - 1. Reference Landscape Plans
- B. Stakes and Guys
 - 1. Stakes - 2' metal t-posts and 6' wood posts
 - 2. Guys - 12-gauge galvanized steel wire
 - 3. Nylon straps - 1 1/2", with metal grommet ends.
 - 4. 3/4" White, PVC pipe, 24" lengths.

- C. Tree Wrapping
1. Not to be used.
- D. Trees, Shrubs, Ornamental Grasses, and Flowers
1. Provide nursery grown trees, shrubs, ornamental grasses, and perennials unless otherwise indicated, grown in a recognized nursery in accordance with good horticultural practice, with healthy root systems developed by transplanting or root pruning. Provide only healthy vigorous stock, free of diseases, insects, eggs, larvae, and defects such as knots, sunscald, injuries, abrasions, or disfigurement. Only plants grown in Hardiness Zones 2,3,4, and 5 will be accepted. Hardiness Zones are defined in U.S. Department of Agriculture publications. Grower's certificates may be required when doubt exists as to the origin of the plant material.
 2. Provide trees, shrubs, ornamental grasses, and flowers true to name and variety established by the American Joint Committee on Horticultural Nomenclature "Standardized Plant Names", Second Edition, 1942.
 3. Provide trees, shrubs, ornamental grasses, and flowers of the size shown or specified in the plant list and in accordance with the dimensional relationship requirements of ANSI Z60.1 for the kind and type of plant material required. Plant material larger than the specified size may be used, in which case the sizes of the root balls will be increased proportionately.
 4. Label each tree and shrub with a securely attached waterproof tag bearing legible designation of botanical and common name and size.
 5. Where formal arrangements or consecutive order of plants are shown, select stock for uniform height and spread, and label with numbers (if necessary) to assure symmetry in appearance of planting.
 6. Provide plant material complying with the recommendations and requirements of ANSI Z60.1 "Standard for Nursery Stock" and as further specified.
- E. Deciduous Trees
1. Provide trees of the height and caliper listed or shown.
 2. Where shade trees are required, provide single stem trees with straight trunk and intact leader, free of branches to a point six (6) feet above the ground.
 3. Where small trees of upright or spreading type are required, provide trees with single stem, branched, or pruned naturally according to species and type, and with the relationship of caliper and branching recommended by ANSI Z60.1, unless otherwise shown.
 4. Where shown as "bush form" provide trees with 3 or more main stems starting close to the ground in the manner of a shrub.
 5. Where shown as a "clump form" provide trees with 3 or more stem starting from the ground.
 6. Provide balled and burlapped deciduous trees unless noted as container plants. Balled and burlapped plants shall be dug with firm, natural balls of earth of the diameter specified or larger, to encompass the fibrous and feeding root system necessary for full recovery of the plant.
- F. Deciduous Shrubs and Groundcovers
1. Provide deciduous shrubs with not less than the minimum number of canes required by ANSI Z60.1 for the type and height of shrub specified.
 2. Plants furnished in containers shall have been grown in pots, cans, or baskets long enough to have sufficient roots to hold earth together intact after removal from container, without being root bound.

- G. Coniferous and Broadleaf Evergreens
1. Provide evergreens of the size shown.
 2. Provide evergreens with well-balanced form complying with requirements for other size relationships to the primary dimension shown.
 3. Trees shall exhibit consistent growth periods and shall not exhibit signs of accelerated growth.
 4. Provide balled and burlapped evergreen trees unless otherwise noted as container or collected stock.
 5. Foliage shall have a good intense color.
 6. Trees shall contain a central dominant leader with evenly spaced branches. Plants containing multiple central leaders will be rejected.
- H. Requirements for Balled and Burlapped Stock:
1. Where shown or specified to be balled and burlapped, provide trees and shrubs dug with a firm, natural ball of earth in which they were grown.
 2. Provide ball size of not less than the diameter and depth recommended by ANSI Z60.1 for the type and size of tree or shrub required. Increase ball size or modify ratio of depth to diameter as required to encompass the fibrous and feeding root system necessary for full recovery of trees or shrubs subject to unusual or atypical conditions of growth, soil conditions, or horticultural practice.
 3. Wrap and tie earth ball as recommended by ANSI Z60.1 for the size of balls required. Drum-lace balls with a diameter of thirty inches (30") or greater.
- I. Requirements for Container Grown Stock
1. Where specified as acceptable, provide healthy, vigorous well rooted shrubs or ornamental grasses established in the container in which they are sold.
 2. No bare rooted or recently containerized stock will be accepted.
 3. Established container stock is defined as a tree or shrub transplanted into a container and grown in the container for a length of time sufficient to develop new fibrous roots so that the root mass will retain its shape and hold together when removed from the container.
 4. Use rigid container which will hold ball shape and protect root mass during shipment.
 5. Provide trees and shrubs established in containers of not less than the minimum sizes recommended by ANSI Z60.1 for the kind, type, and size of trees and shrubs required.
 6. Perennials and ornamental grasses provided in containers shall have well developed root masses without being root bound and should display an appropriate amount of foliage for the time of year in which they are being planted. Cutting back of perennials and grasses for fall planting is acceptable assuming a portion of the plant is visible and cutting does not damage the growing portions of the plant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The Contractor shall inspect the site with the Owner and/or Owner's Representative prior to beginning any activities on site. The contractor shall provide a written report of any discrepancies that would interfere with their scope of work or would delay progress on the project.

3.2 INSTALLATION

- A. Proceed with and complete the landscape work as soon as portions of the site become available, working within the seasonal limitations for each kind of landscape work required.
- B. Cooperate with any other contractors and trades which may be working in and adjacent to the landscape work areas. Examine drawings which show the development of the entire site and become familiar with the scope of all work required.
- C. Final Plant Locations
 - 1. Stake location of individual trees for approval by Landscape Architect prior to planting or excavating.
 - 2. If a new tree or shrub needs to be relocated due to interference with underground piping or wiring, the Contractor shall notify the Owner's Representative and receive approval of a new location by Landscape Architect. Any changes shall be shown on the as-built drawings provided by the Contractor at Initial Acceptance.
 - 3. The Landscape Architect must approve the precise location of all plants prior to pit excavation and installation.
 - 4. Make minor adjustments as requested by the Landscape Architect or as necessary to avoid conflicts with sprinkler line locations.
- D. Excavation For Planting
 - 1. Where rubble fill is encountered, notify the Owner's Representative. Prepare planting pits properly by removal of rubble or other acceptable methods.
 - 2. If rock, underground construction work, or other obstructions are encountered in excavation for planting of trees or shrubs, notify the Owner's Representative. If necessary, new locations may be selected by the Owner's Representative. Any changes shall be shown on the as-built drawings provided by the Contractor at Initial Acceptance.
 - 3. If subsoil conditions indicate the retention of water in planting areas, as shown by seepage or other evidence indicating the presence of underground water, notify the Owner's Representative before backfilling.
 - 4. Tree pits shall be dug with flat bottoms and vertical sides. Tree pits shall be dug with radius equal the diameter of the root ball. All tree pits shall have a minimum depth to accommodate root ball.
 - 5. The Contractor is responsible for demonstrating to the Owner's Representative that planting pits have adequate drainage. This shall be performed by digging sample holes throughout the site and filling them with water. Holes must drain within twenty-four hours to be acceptable. Pits that do not drain shall be provided with twelve-inch (12") diameter by thirty-six inch (36") deep auger holes (one per tree pit) to be filled with 1 1/2" gravel. A change order will be issued if the Owner's Representative determines drain holes shall be installed.
- E. Setting and Backfilling
 - 1. For container grown stock, excavate pit at least twice as wide as the container.
 - 2. Set tree ball plumb and in the center of pit or trench with top of ball 2" minimum above adjacent landscape grades. Remove burlap from sides and tops of balls, but do not remove from under balls. Remove platforms, if any, before setting. When setting place additional backfill around base and sides of ball and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.
 - 3. No burlap shall be pulled out from under balls.
 - 4. Entire wire basket and surplus nylon or binding shall be completely removed, taking care not to damage the root ball. Any roots which are bruised or broken shall be pruned at the time of planting.
 - 5. After planting, the Contractor shall water each plant regularly until Final Acceptance.

6. For plantings in non-turf areas, provide berm around the edge of excavations to form shallow saucer to collect water and to hold mulch.

F. Mulching

1. Fine grade all planting beds to be mulched allowing for full depth of specified mulch.
2. Place specified mulch evenly over all areas at depth indicated on plans.
3. Rake and feather finish grade of mulch level and 1/2" below adjacent edger surfaces.
4. Make sure mulch is at full depth at adjacent walks and paved surfaces and that mulch doesn't protrude above these surfaces.
5. Mulch a 24" diameter ring around all trees in turf areas with specified depth of wood mulch, after irrigation areas have been watered in.
6. All trees and shrubs in native areas are to have a mulch ring equal to the diameter of the planting pit. Mulch shall be a uniform three inches in depth. Do not remove saucer (or berm) around plants in native areas when mulching.

G. Pruning

1. Prune, thin out, and shape trees and shrubs in accordance with standard horticultural practice. Prune trees to retain required height and spread.
2. Do not cut tree leaders. Remove only injured or dead branches from flowering trees.
3. Prune shrubs to retain their natural character and shape, and to accomplish their use in the landscape design.
4. Required shrub sizes are the size after pruning.
5. Remove and replace excessively pruned or deformed stock resulting from improper pruning.

H. Guying and Staking

1. Removal of all guying and staking shall not occur prior to the 3rd growing season and the cost shall be included as part of the installation of the work.
2. Deciduous guying system
 - a. Pound stakes 2' deep minimum into undisturbed soil beyond the planting pit so that stake is secure. Secure wire through metal grommets on nylon strap and wrap above first branch or at mid-point of tree. Secure guy wire to stake so that it is taut but allows some movement and so that no sharp projections of wire are extending from post. Adjust tension on wire if needed. Flag guy wire with 3/4" PVC pipe for visibility.
3. Conifer guying system
 - a. Pound stakes 2' minimum into undisturbed soil beyond the planting pit so that stake is secure, angling away from planting pit and so that top is flush with finish grade. Secure wire through metal grommets on canvas strap and wrap at midpoint of tree. Secure guy wire to stake so that it is taut but not overly tight and so that no sharp projections of wire are extending from post. Adjust tension on wire if needed. Flag guy wire with 3/4" PVC for visibility.

3.3 FIELD QUALITY CONTROL

- A. When all the landscape work is completed, the Landscape Architect shall inspect the landscape work to determine if the work is complete upon seven (7) calendar days advance notice by the Contractor. The Landscape Architect in conjunction with the General Contractor, Owner, and any additional required parties, shall prepare a punch list of items improperly installed, inadequately sized, or otherwise deficient based on the findings of his inspection. The punch list shall be completed not more than seven (7) working days after the Initial Acceptance walk-through. When the Contractor has remedied all deficiencies and completed all items on the punch list, the Contractor shall request another inspection by the Landscape Architect to determine whether the deficiencies have been adequately corrected. Once the punch list items have been corrected and re-inspected, the Landscape Architect shall issue an Initial

Acceptance letter to the Owner who will then respond to the Contractor in writing formally accepting the work and beginning the warranty period.

- B. Thirty (30) days prior to the completion of the warranty period, the Landscape Architect, shall inspect the landscape work to determine if the work is complete upon seven (7) calendar days advance notice by the Contractor. The Landscape Architect in conjunction with the General Contractor, Owner, and any additional required parties, shall prepare a punch list of items improperly installed, inadequately sized, or otherwise deficient based on the findings of his inspection. The punch list shall be completed not more than seven (7) working days after the Final Acceptance walk-through. When the Contractor has remedied all deficiencies and completed all items on the punch list, the Contractor shall request another inspection by the Landscape Architect to determine whether the deficiencies have been adequately corrected. Once the punch list items have been corrected and re-inspected, the Landscape Architect shall issue a Final Acceptance letter to the Owner who will then respond to the Contractor in writing formally accepting the work. The required maintenance instructions shall be forwarded to the Owner's Representative and Owner prior to the Final Acceptance to inform the Owner of any maintenance responsibilities that would be required for the project.

3.4 ADJUSTING AND CLEANING

- A. During landscape work, store materials and equipment where directed.
- B. Keep pavements clean and work areas in an orderly condition.
- C. Protect landscape work from loss, damage, and deterioration during storage, installation, and maintenance periods.
- D. Protect from trespassers, as well as from operations by other Contractors and tradesmen and landscape operations.
- E. At the time of the Final Acceptance walk-through and before the issuance of Final Acceptance, all paved areas shall be thoroughly cleaned by the Contractor by sweeping and washing. All construction equipment, excess materials, debris, or rubbish shall be removed from the site.

END OF SECTION 329000

SECTION 329010 - LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.1 SUMMARY

- A. This section provides guidance on long term maintenance and care for landscape areas, as defined as the period between Initial Acceptance and Final Acceptance and the period beyond Final Acceptance if contracted. However, this section can be used as general guidance during the interim maintenance period, as defined as the time frame between installation of landscape and Initial Acceptance.
- B. The Contractor will perform irrigation management, fertilization, pruning, weeding, pesticide and herbicide applications, bed cultivation, mowing, edging, and litter removal in landscape areas. Clean up of walkways, trails, and open space within the project limits are included.
- C. Unit Prices
 - 1. The Contractor will furnish all materials, equipment, supplies, and personnel necessary to perform the services contained herein.
- D. Project Communication
 - 1. The Contractor shall have one person designated as the Contract Manager. The Contract Manager shall be available for a meeting or site walk through at least once each month upon request of the Property Manager.
 - 2. The Contractor will advise the Property Manager, the Owner, or the Owners Representative of all actions the Contractor believes are prudent, necessary, or beneficial, to improve and maintain the appearance and health of the landscape at the property.

1.2 REFERENCES

- A. Refer to Section on General Landscape
- B. GreenCO Best Management Practices

1.3 QUALITY ASSURANCE:

- A. All work shall be performed to the highest standards of horticultural excellence and shall be in accordance with standard practices. All work shall be performed in accordance with all applicable laws, codes, ordinances, and regulations of all Local, State, and Federal government agencies. It is the responsibility of the Contractor to obtain all necessary certificates, permits and licenses required by such agencies at their own cost.
- B. Contractor shall maintain a weekly landscape maintenance log indicating services performed. Submit reports weekly to the Owner's Representative using e-mail.
- C. Contractor shall assume all responsibility for plant material or turf which is damaged or stressed in any way because of poor maintenance. Contractor will assume all cost associated with replacement of damaged plant material.

PART 2 - PRODUCTS

- A. Materials used for maintenance shall be supplied by Contractor unless otherwise specified.
- B. Any replacement plant materials shall conform to the sizes identified in the landscape construction documents.
- C. Any replacement non-organic landscape materials shall conform the type, size and condition of the material being replaced.

PART 3 - EXECUTION

3.1 TREE MAINTENANCE

- A. Pruning
 - 1. The following will be used as guidelines for pruning maintenance on trees. Pruning will be accomplished in the early spring and late winter. Pruning in this agreement will be initiated for the following.
 - a. Plants too close to a building, walkway, fence, power line or any tree limiting visibility shall be pruned appropriately to reduce the obstructing branches.
 - b. Removal of diseased, insect infested, or weak growth portions of the tree.
 - c. Pruning to remove storm damage or other mechanical injury. Pruning to shape or remove excess unwanted growth or winter die back.
 - d. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or 48 inches and radial orientation so as not to overlay one another; to eliminate diseased or damaged growth; to eliminate narrow V-shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns; to maintain growth within space limitations; to maintain a natural appearance; to balance crown with roots. Under no circumstances will stripping of lower branches ("raising up") of young trees be permitted. Lower branches shall be retained in a "tipped back" or pinched condition with as much foliage as possible to promote caliper trunk growth (tapered trunk). Lower branches can be cut flush with the trunk only after the tree is able to stand erect without staking or other support.
 - e. The primary pruning of deciduous trees shall be done during the dormant season. Damaged trees or those that constitute health or safety hazards shall be pruned at any time of the year as required.
 - f. Coniferous trees shall be thinned out and shaped when necessary to prevent wind and storm damage.
 - 2. Pruning for general clean-up of trees is required in the late winter or early spring prior to the activation of the irrigation system.
 - 3. Pruning specified as "normal maintenance" will include trees or tree limbs, which are up to twelve (12) feet tall using conventional pruning tools.
 - 4. The Contractor must immediately contact the Owner concerning trees which may present a threat to the public safety. The Owner should be contacted so that the threat may be eliminated, and a price negotiated for the repair.
 - 5. The Contractor is not responsible to repair or replace any plant materials damaged or killed by vandalism or extreme conditions beyond the Contractor's control, as reasonably determined by the Owner's Representative. Plant materials damaged or killed as the result of the Contractor's actions or neglect will be replaced in kind at the Contractor's expense.
 - 6. All pruning will be performed by qualified personnel and will require supervision by an arborist if requested by the Owner.
 - a. Final cuts on branch removal must be made just outside the flare of the branch base, not flush with the tree trunk.

- b. Limbs removed from a tree must be cut near a crotch. Bracing, cabling, and lip bolting may be required in special instances.
 - c. Damaged, dead, or dying trees and shrubs will be removed only upon approval of the Owner's Representative by June 10th, except damaged trees or those which constitute health or safety hazards will be pruned or removed at any time of the year as required. Cost to remove and dispose of dead plant material is the sole responsibility of the Contractor.
- B. Care of wounds
 - 1. The Contractor must take prompt action to repair any injuries that occur to plants and immediately initiate the repair. Repairs will be completed only by competent employees trained and familiar with repair techniques.
 - 2. Storm or severe wind injury must be addressed immediately after any storm to determine the extent of any plant related injuries.
 - 3. Bark may also be destroyed by animals, sunscald, mowers, or vandalism. The Contractor shall treat bark injuries according to the current industry standards.
 - 4. Tree paint shall not be used to treat wounds.
- C. Tree Wrap
 - 1. Deciduous trees with up to a 4" trunk diameter and trees with newer, less established thin bark will be wrapped.
 - 2. Trees will be wrapped each fall no later than November 1st. Tree wrap will be removed on or around April 15th, but no later than May 15th. Weather, location of tree, or other environmental factors influence date of application and removal.
 - 3. Wrap from the ground to the first major branch. Secure by stapling or using jute. Do not use electrical tape.
 - 4. Use a commercially available tree wrap as indicated in these technical specifications.
- D. Fertilization
 - 1. Fertilize trees with 18-7-10 formulation, slow-release fertilizer. Apply 6 oz./100 s.f.
 - 2. Apply once in spring. Apply by spreading fertilizer evenly around the ball of the tree. Apply from the trunk out to the drip line.
 - 3. If trees exhibit iron chlorosis, provide foliar fertilization with chelated iron. Cost of foliar fertilization is part of this contract. Avoid contact with all stainable surfaces including concrete sidewalks, pavers, planter walls, rock mulch, project signage, and lights. Obtain written authorization of Owner's Representative prior to fertilization.
- E. Insecticide application:
 - 1. All insecticide shall be applied by a licensed professional only.
 - 2. Any spray application shall be timed properly to minimize damage and maximize chemical effectiveness.
 - 3. Prior to any treatment the contractor shall submit manufacturer data sheets for each chemical (insecticide) intended for use. This submittal shall also include a statement about signs or symptoms identified thereby justifying spraying of trees. This submittal must be approved and must be submitted a minimum of five days prior to the intended date for treatment.
 - 4. All deciduous trees shall be inspected for signs of insect damage and treated with the appropriate chemical for insect species observed. Generally deciduous trees will require one treatment in late May.
 - 5. All evergreen trees shall be inspected for signs of insect damage and treated with the appropriate chemical for insect species observed. The contractor should pay careful attention to evergreens for signs of beetles, weevils, aphids, and bores
 - 6. All pine trees (*Pinus*) shall receive one application of approved insecticide to treat for and reduce the infestation of the Ips beetle.
 - 7. The cost for treatments shall be based off unit prices contained in bid documents.

F. Mulching

1. Mulched tree rings will be well maintained. Additional mulch may be added to these only after the approval of the Owner, using the prices submitted in the supplementary bid schedule.

3.2 PLANTING BED CARE

A. Pruning

1. Prune shrubs and flowers to maintain a natural appearance. There are no plantings in which shearing is intended.
2. Cut back ornamental grasses to $\frac{1}{4}$ of their mature height in the spring during March. Remove and dispose of cuttings.
3. Cut back herbaceous perennials to the ground in March. Remove and dispose of cuttings.
4. Prune all dead, diseased, and dying branches.
5. Prune long uncharacteristic branches that detract from the shrub's overall form. Prune branches adjacent to bare spots to encourage full shrub growth.
6. Prune flowering shrubs within two weeks after flowering has ended to prevent pruning of future flower buds.
7. Prune ground covers to maintain a natural appearance and to prevent ground covers from climbing shrubs.
8. Cut back taller growing herbaceous perennials when they become rangy in appearance.
9. Cut back bulbs after foliage has turned a 50-75% yellow and begun to fall off.
10. Prune shrubs too close to a building, walkway, fence, power line or any tree limiting visibility to reduce the obstructing branches.
11. Removal of diseased or insect infested or weak growth portions of the shrub.
12. Pruning to remove storm damage or other mechanical injury. Pruning to shape or remove excess unwanted growth or winter die back.
13. Shearing
 - a. Never, unless a hazardous situation exists, and only after the approval by the Owner, will the contractor shear a shrub.
 - b. Shearing is not a practice that helps maintain a native image and design.
 - c. This shall exclude clump grasses, as shearing is the recommended method of pruning in the spring prior to re-growth.
14. Renewal pruning: overgrown shrubs usually are leggy, lacking foliage in the lower one-half to two-thirds due to shading from the top or non-flowering. This pruning activity should be accomplished during the dormant season pruning. Height reduction may be accomplished at the same time. This activity is accomplished by removing the oldest and weakest canes at or near ground line. All branches can be cut to the ground or one-third of the oldest branches can be removed every year.
15. Thinning shrubs: the Contractor will remove the oldest canes each winter (canes over four (4) seasons old). Insignificant small shoots will be removed to the base or to the crotch of the plant.
16. Heading back: the Contractor will head back isolated shoots which may cause the plants to become out of balance. Prune to the base of the branch or the crotch.

B. Fertilization

1. In April, fertilize all planting beds with 18-7-10 formulation, slow-release fertilizer at the rate of 6 oz/1,000 sq. ft. Use a broadcast method for application of fertilizer.

C. Bulb and Perennial Maintenance

1. In the spring, divide perennials when they become too crowded. Relocate divisions to bare spots. Do not overly thin.

D. Mulching

1. Shrub bed areas will be well maintained at the depth indicated on landscape plans. Additional mulch may be added to these only after the approval of the Owner, using the prices submitted in the bid schedule.

E. Weeding

1. Weeds represent the greatest threat to successful establishment of areas. Therefore, a vigorous, elevated level of weed control is necessary to maintain an attractive, healthy landscape.
2. Spot control weeds bi-weekly using chemical and/or mechanical means. Do not spray in windy weather. Use extra caution in application of chemicals to prevent overspray onto desired plant material.
3. Mechanical means are the preferred methods for removal of weeds.
4. Planting beds shall be inspected bi-weekly for weeds.
5. If spraying weeds, dead material shall be removed from planting beds immediately so as not to create tumbleweeds or unnecessary debris.

3.3 IRRIGATED MANICURED TURF CARE

A. Mowing and Edging

1. Mowing shall occur on a day agreed upon with the Owner, with an alternate day in the event of rain.
2. The frequency of mowing may vary in the spring and fall due to seasonal weather conditions and growth rate of turf.
3. In the event the season is longer or shorter or if inclement weather prohibits safe operation of equipment on the regularly schedule mowing day, the mowing schedule shall be adjusted according to current conditions.
4. All turf areas shall be mowed weekly during the growing season to a height of no shorter than 4 inches. All turf areas shall be cut to the same height and shall be crosscut when feasible.
5. The mower blades or reels shall be sharpened and maintained to provide a smooth, even cut without tearing. The result shall be a uniform, level cut without ridges or depressions.
6. Do not use heavy mower in areas prone to rutting.
7. Do not leave tire marks on sidewalk.
8. Mowing shall be performed so that no more than one-third (1/3) of the grass blade is removed during each mowing.
9. Edging of walks and curbs will be performed every other mowing during the growing season using a steel blade edger. All debris shall be removed from street and walks.
10. Chemically edge and manually trim around trees monthly ensuring that turf grows no closer than eighteen inches (18") to the tree trunk— a three-foot diameter ring around each tree. This bare area should be a uniform circle using the trunk as a center point. This area should be mulched with the specified wood bark mulch.
11. Mow and trim around walls, fences, and trees, keeping mulch in saucers and beds.
12. All turf areas inaccessible to mowing equipment will be trimmed weekly as needed to maintain a neat, well-groomed appearance, including around fence row areas, streetlights, transformers, and phone pedestals.
13. Trim growth around all lamp posts, drains and other permanent structures located on the turf on a weekly basis during the growing season.
14. Protect trees and shrubs from damage caused by trim lines. Replace all plant material killed or seriously injured by trim lines. Replace with plants of equal or better size and quality. Replace at no cost to Owner. Seriously injured is defined as when 30% or greater of the cambium layer of the trunk circumference has been removed by trim lines or when shrubs have been seriously deformed in the opinion of the Owner's Representative.
15. Protect fences, buildings, and other structures from damage caused by mowers or trim lines.

16. Clippings on paved areas or crusher fine trails shall either be vacuumed or blown off and removed from walks and streets.
17. Excessive grass clippings should be removed, as necessary.
18. Trash shall be picked up with each mowing.
19. If mowers cause damage or notice damage or over watering the area should be marked with marker flags or flagging tape. Observations should be reported to the site superintendent who will implement the necessary action.

B. Fertilization

1. In April, the turf shall be fertilized with quality slow-release granular product intended to fertilize and control broad leaf weeds. Unless otherwise directed or the Contractor has other suggestions, use fertilizer between a (4-1-1) up to a (10-1-1) ratio of nitrogen to phosphorus to potassium with 25% to 50% slow-release nitrogen from sulfur coated urea (SCU) at a rate of two pounds of nitrogen per 1,000 square feet.
2. In late September, the turf shall be fertilized to stimulate root growth using a granular urea fertilizer with ratios between (10-1-3) and (10-1-7) at a rate of two pounds of nitrogen per 1,000 square feet, unless otherwise directed or the contractor has other suggestions.
3. Fertilizer shall immediately be removed from concrete walls, curbs, and streets to prevent staining and runoff into waterways.
4. Fertilizer should be watered in thoroughly after application.
5. Iron may be required where soils are high in pH, or where visible deficiencies are noted.

C. Insect Disease Control – Turf

1. Insect and disease treatment shall be by application of necessary insecticides and fungicides as conditions of turf requires. The cost of this will be covered under an extra to the agreement with price agreed upon by Contractor and Owner prior to initiating the work.

D. Aeration

1. The contractor shall aerate one time per year in September to improve water penetration, before the second fertilization. Contractor shall use only a hollow core tine aerator that pulls a 3" plug.
2. Prior to aeration the contractor shall tag all sprinkler heads and valve boxes to prevent damage. Plugs shall be left on the turf to assist in breaking down thatch.
3. Irrigation system will be checked out for damage by the Contractor immediately after aeration and any damage due to aeration will be the responsibility of the Contractor to repair at his expense.
4. Damage to any other fixture will be repaired at the Contractor's expense.

3.4 NATIVE TYPE GRASS AREA MAINTENANCE

A. Mowing

1. Schedule mowing of a four foot (4') wide strip along all fence lines on a bi-weekly basis. Mowing will include string trimming around fence posts, under fence rails, and wet areas where mowers will cause rutting.
2. Any irrigation damages observed or caused from mowing should be identified with marker flags immediately. Flagging shall remain in place until the damage has been fixed.
3. When areas are too wet to mow without damage and this is caused by irrigation from a residential lot, the contractor shall tie flagging tape to the fence rail of the lot(s) impacting drainage.
4. The Owner will select areas to be mowed for control of annual grasses and weeds. A diagram of areas to be mowed will be provided by the Owner. The cost of mowing will be based on unit costs supplied with the bid documents.

5. Requests by the Owner for mowing shall be completed within ten (10) calendar days of the request unless alternate agreements are reached or as weather allows.
6. The Contractor shall expect to perform a significant amount of mowing during the second week of May.
7. Drainage swales will only be mowed when directed by the Owner's Representative.

B. Weed Control

1. Where specified by the Owner, a complete broadleaf herbicide treatment shall be applied during the third week in May. The Owner shall provide a diagram and schedule for areas to be treated.
2. Throughout the growing season weed control of native areas shall be performed using a spot treatment method.
3. Herbicide shall be applied by a licensed applicator or under the direct supervision of a licensed applicator. Any collateral damage because of spraying will be the responsibility of the Contractor.
4. Do not spray in windy weather. Use extra caution in application of chemicals to prevent overspray onto desired plant material.
5. The Contractor shall use Chaparral™ brand herbicide (manufactured by Corteva Agriscience) for treatment in native areas. Apply and mix in accordance with the manufacturer's product specifications.
6. Chemical treatment of weeds within four feet of fence lines, occupied residential lots, or planting beds shall be performed using a hand sprayer or backpack sprayer to minimize overspray.

C. Overseeding and Re-Seeding

1. When directed by the Owner, re-seeding areas shall be completed using a broadcast method.
2. The cost of seeding shall be determined using the unit costs supplied in the bid documents multiplied by area measurements.
3. Hydromulching shall be required only when requested by the Owner. Hydromulch and tackifier shall be applied at a rate equal to 2,000 lbs. per acre.
4. Reseeding and overseeding shall begin to occur during the third week in June.
5. Broadcast seed rates
 - a. Shortgrass – 36 pounds of pure live seed per acre
 - b. Tallgrass – 30 pounds of pure live seed per acre

3.5 NOXIOUS WEED CONTROL

- A. Remove noxious weeds, as defined by the State of Colorado, from the area within five feet of the perimeters of the landscaped areas by spraying with an approved broadleaf herbicide by May 15th and October 1 with spot application as required. Cost for spot applications, shall be done on a time and material basis per the contract documents.

3.6 REPLACEMENTS

- A. The Contractor shall note in maintenance logs all removed plant material. Replacements shall occur as directed by the Owner's Representative.
- B. If replacement becomes necessary, conform to material and installation standards (including a one-year warranty) established in the original project specifications.
- C. Replace plant material with size equal to that of the plant material being replaced unless otherwise directed by the Owner's Representative.

- D. All replacements shall be affixed with an inconspicuous tag, to be removed after the warranty has expired. This tag shall indicate the date the plant material was installed.

3.7 DISEASE AND INSECT CONTROL

- A. Inspect all landscape areas weekly during growing season for signs of insect or disease infestation.
- B. Apply seasonal applications as necessary to protect plant material.
- C. Spot treat areas as needed to maintain healthy growing plant material. Spot treatment is included in the scope of this contract.
- D. Do not apply airborne insecticides or pesticides when unprotected people or animals may be affected.
- E. Protect all trees, shrubs, and groundcovers from over spray that is detrimental to the health of ornamental plant material.
- F. Notify Owner's Representative if extensive spraying is required. Pricing for maintenance work should include the costs of typical pesticide applications.

3.8 SOFT SURFACE TRAIL AND ROADSIDE BAND (CRUSHER FINES) MAINTENANCE

- A. The Contractor shall stockpile 10 cubic yards of crusher fines material on the site annually to be used for trail and band maintenance. This stockpiled material shall be protected in accordance with the Storm Water Management Plan.
- B. During routine site inspections the Contractor shall report to the Owner's Representative any areas prone to erosion or that have eroded.
- C. The Owner's Representative will provide direction on how to perform repairs.
- D. Replenishing materials shall be done on a time and materials basis, as defined in the bid documents.
- E. Measurement of the area of work will be performed by the Owner's Representative to compare against the amount of time required to repair work.
- F. Trails and Roadside Bands shall remain compacted, free of puddling, and weed free.
- G. Chemical methods for weed control are acceptable.
- H. Desirable grasses shall be allowed to creep into these areas, creating a less formal edge. Do not create a crisp edge using chemical weed sprays. Generally, trails should be 36" wide and roadside bands should be 24" wide.

3.9 TRENCH DRAINS

- A. The Contractor should visually inspect area inlets and outlets for trench drains to ensure they are unimpeded during weekly inspections.

- B. String trim around inlets and outlets when mowing at least every two (2) weeks to ensure surface drainage can flow freely.
- C. When trench drains are blocked, notify the Owner's Representative for further direction. The contractor may be asked to provide a quote for repairing trench drains.

3.10 TRASH REMOVAL AND CLEAN UP

- A. Clean all areas weekly to provide a neat, well-groomed site. Pick up all trash and debris, sweep walks, replace mulch in beds, reinstall weed barrier wherever it has risen above the mulch or pulled loose at the edges.
- B. Adjust cleanup to match seasonal needs.
- C. All landscaped areas, native and irrigated, will be policed for loose trash and debris on a weekly basis during the entire year, especially before each mowing.
- D. Trash cans shall be emptied weekly.
- E. Dog stations shall be emptied weekly. The Contractor will not be responsible for refilling stations with bags.
- F. Provide weekly, complete policing and litter pickup to remove paper, glass, trash, undesirable materials, animal and bird droppings, siltation, and other accumulated debris within the hard surfaces and landscape areas to be maintained, including but not limited to walkways, between and around planted areas, drains, catch basins, and pond edges.
- G. Litter pickup shall be completed as early in the day as possible, but in no case later than 10:00 A.M.
- H. The Contractor shall be responsible for off-site removal of all trash, litter, and accumulated debris to an approved disposal site weekly.
- I. Fallen leaves will be cleaned up twice per year from all turf and bed areas - once between April 1st and May 1st and the second time between November 15th and December 1st. In turf, the leaves can be mowed and left in place.

3.11 SWEEP/WASHING

- A. Check paved areas every two (2) weeks for cracks, crevices, and deterioration. Report any problems to Owner's Representative immediately. Walkways, trails, hard surface areas, shall be cleaned, including but not limited to the removal of all foreign objects from surfaces, such as gum, grease, paint, graffiti, and broken glass. Methods of sweeping of designed areas can incorporate one or all the following:
 - 1. Power pack blowers
 - 2. Vacuums
 - 3. Brooms
 - 4. Push power blowers
- B. In the event the Contractor elects to use power equipment to complete such operations, the Contractor shall be subject to local ordinances regarding noise levels. Any schedule of such operations may be modified by the Owner's Representative to ensure that the public is not unduly impacted by the noise created by the equipment.

- C. Sweep all walkway and hard surface areas once per week following mowing.

3.12 GRAFFITI

- A. Eradication and control shall include all surfaces throughout the site, including:
 - 1. Walkways and hard surfaces
 - 2. Site furniture
 - 3. Boulders
 - 4. Retaining walls
 - 5. Monumentation
 - 6. Signage
 - 7. Lighting
- B. All materials and processes used to remove graffiti shall be approved by the Owner's Representative and non-injurious to surfaces and adjacent property.
- C. Appropriate surface preparation shall be made on painted surfaces. Paint applied shall be the exact shade of color as existing paint, unless otherwise approved by the Owner's Representative.
- D. The Contractor shall use particular care and attention when removing graffiti from treated or sealed surfaces. Such surfaces shall not be painted. The Contractor shall use materials and methods of application approved by the manufacturer and the Owner's Representative.
- E. Visually inspect all areas weekly. Remove graffiti the same day it is visually noted.
- F. Graffiti is not part of the base maintenance contract and will be paid for on an hourly basis as approved by the Owner at the stipulated unit price.

3.13 PEST CONTROL

- A. The Contractor shall report to the Owner the existence of any pests that are damaging, interfering with, or have the potential to damage or interfere with the landscaping or irrigation system, including but not limited to, prairie dogs, voles, and porcupines. The Contractor shall remove pests as directed by the Owner, using only subcontractors approved by the Owner. The Contractor will be paid using a supplementary pricing for pest removal equipment and labor. Removal may include relocation of the pest.

3.14 STANDARD WINTER SERVICES

- A. All landscaped areas should be patrolled weekly for loose trash and debris.
- B. Remove leaves resulting from fall leaf drop only in areas having a heavy concentration of leaves that may cause damage to turf or to other landscape materials.
- C. The Contractor shall be responsible to monitor all landscape and plants to determine if there is need for winter watering, tree wrapping to prevent sunscald, or special pruning due to storm damage. A semi-monthly soil moisture assessment, on the Contractor's report, shall be provided to the Owner.

- D. When hand watering, use a water wand to break the water force. All trees and shrubs shall be winter watered using a needle type root feeder as required between irrigation system winterization and spring startup.
- E. The irrigation system will not be used for winter watering.

END OF SECTION 329010

SECTION 329113 - HIGH ALTITUDE SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Work in this Section includes, ripping, fertilizing, soil conditioning, and fine grading as shown on plans and details, included on construction drawings, as under this contract.

1.2 SUBMITTALS

- A. Refer to General Landscape Section

1.3 DELIVERY, STORAGE AND HANDLING

- A. Comply with related sections

1.4 PROJECT/SITE CONDITIONS

- A. Do not perform work when climate and existing site conditions will not provide satisfactory results.
- B. Vehicular accessibility on site shall be as directed by the Owner's Representative. Repair damage to prepared ground and surface caused by vehicular movement during work under this section to original condition at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Compost
 - 1. A totally organic product that has been aerobically and naturally processed without the addition of coarse wood chips, in such a manner as to maintain a consistent temperature of 140 degrees Fahrenheit or greater for a period sufficient to create the following characteristics, measured by dry weight.
 - a. Moisture content of 30%-35%
 - b. Organic matter to nitrogen ratio: 25:1 to 30:1.
 - c. pH: 6.0 to 8.0 pH.
 - d. Salts: maximum of 10 mmhos/cm.
 - e. Less than 1% soil, dirt or sand.
 - f. Maximum particle size of ½ inch diameter.
 - g. Eradication of all harmful weed seeds, pathogens, and bacteria.
 - h. A non-offensive, earth smell.

2. Acceptable materials are as follows.
 - a. A-1 Organics - BioComp
 - b. Front Range Materials (Arvada, Colorado, 303-960-9996)– FRM Premium Compost (Item #2-101)
 - c. Certified “Class I” compost product
 - d. Or Approved Equal

B. Topsoil

1. Import topsoil in sufficient quantities to complete the work. Obtain independent soils test which will recommend amendments required to meet the following qualifications. Amend topsoil per soils laboratory recommendations.
 - a. Composition: Use as a planting medium, only fertile, friable, well-drained soil, or uniform quality, free of stones over 1 in. diameter, sticks, oils, chemicals, plaster, concrete, and other deleterious materials, with an acidity range between pH 5.5 and 7.0. It shall contain sand and clay in approximately equal proportions and shall have some organic content by weight.

C. Plant Mix Backfill for Trees

1. Plant mix shall be used to backfill around all tree plantings as indicated on the drawings. The plant mix shall consist of equal parts (a), (b), (c), plus (d) not accounted for in that ratio.
 - a. Topsoil
 - b. Compost
 - c. Excavated soil
 - d. Myke Pro AN1 (www.usemyke.com) at the manufacturer’s recommended rate for the tree’s size/caliper

Caliper / Height	Myke Pro Cups Each
1.5 in (40 mm)	2
2.0 in (50 mm)	3
2.5 in (65 mm)	4
3.0 in (75 mm)	5
4.0 in (100 mm)	6
4.5 in (115 mm)	7.5
4'	1.75
5'	2
6'	3
7'	3.5
8'	4
10'	5
12'	6
14'	7.5

2. The ingredients shall be thoroughly mixed to produce a mix as integrated as possible.

D. Bluegrass sod, Ecoloturf and irrigated bluegrass seed areas:

1. Spread topsoil over area to be planted to the minimum depths indicated below and mix thoroughly into the soil surface by means of a rototiller or agricultural ripper with tines spaced at no greater than 18 inches.
 - a. 4” depth topsoil.
2. Spread uniform course of sand to a depth of 2” on top of topsoil. Thoroughly mix sand with topsoil tilled to a depth of 8 inches.

3. Thoroughly mix the following amendments tilled to a depth of 8 inches.
 - a. Specified Compost 4.0 c.y. per 1,000 s.f.
- E. Naturalized seed areas
1. Spread topsoil over area to be planted to the minimum depths indicated below and mix thoroughly into the soil surface by means of a rototiller or agricultural ripper with tines spaced at no greater than 18 inches.
 - a. 2" depth topsoil.
 2. All seed areas shall receive "Biosol 6-1-3" organic fertilizer at the time of seeding at a rate of 1,000 pounds per acre. If soils test identify more or less fertilizer required, the contractor will be expected to submit a change order to adjust the contract price for a credit or overage.
 3. Specified Compost 2.0 c.y. per 1,000 s.f.
 4. Thoroughly mix till the areas to a depth of six inches.
- F. Perennial Planting Bed Amendments
1. Spread plant mix over area to be planted to the minimum depths indicated below and mix thoroughly into the soil surface by means of a rototiller or agricultural ripper with tines spaced at no greater than 18 inches.
 - a. 8" depth plant mix.
 - b. Plant Mix shall consist of equal parts of the following:
 - (i) Topsoil
 - (ii) Compost
 - (iii) Sawdust, untreated, well-rotted
 2. Thoroughly mix the following amendments tilled to a depth of eight inches
 - a. Diammonium Phosphate 5.0 lbs. per 1,000 s.f.
 - b. Pre-emergent Weed Controller use manufacturer's specified rate.
- G. Shrub Planting Bed Amendments
1. Plant mix shall be used to backfill around all shrub plantings as indicated on the drawings. The plant mix shall consist of equal parts (a), (b), (c).
 - a. Topsoil
 - b. Compost
 - c. Excavated soil.
 2. Thoroughly mix the following amendments tilled to a depth of six inches
 - a. Specified Compost 4.0 c.y. per 1,000 s.f.
 - b. Diammonium Phosphate 5.0 lbs. per 1,000 s.f.

2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance
1. Compost and other soil amendments are typically identified by a rate of cubic yards per 1000 s.f. To accurately determine if amendments are applied at the correct rate, the following chart is supplied. This chart is intended to verify the cubic yards by allowing a method for measuring the depth of the material spread uniformly across the surface of the planting area, with no exposed soil, prior to mixing the amendments with the existing soils.
 2. This method will be used during inspections to verify that adequate amendments are incorporated into the soil.
- | <u>c.y./1000 s.f.</u> | <u>Depth (inches)</u> |
|-----------------------|-----------------------|
| 2.0 c.y./1000 s.f. | ¾ inch |
| 3.0 c.y./1000 s.f. | 1 inch |
| 4.0 c.y./1000 s.f. | 1 ¼ inches |
| 5.0 c.y./1000 s.f. | 1 ½ inches |

3. An inspection of soil preparation will be performed by the Owner's Representative before areas will be released for planting. The inspection shall consist of taking a soil sample to determine
 - a. Proper tilling of the soil. Soil will be judged on how easily a soil probe can be inserted into the ground.
 - b. Proper depth of tilling, and homogeneity of the soil. The soil sample will be judged on uniformity of the soil profile in the top six to eight inches.
 - c. A visual inspection for adequate compost will be conducted. An area that has similar soil structures, which has not received compost will be used as the basis of comparison. Should a disagreement exist, multiple soil samples will be sent to an independent testing laboratory to determine the amount of organic matter present. The cost of this testing will be absorbed by the Owner's Representative.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General
 1. Verify that existing site conditions are as specified and indicated before beginning work under this Section.
 2. Unknown soil conditions may exist on site. This specification is intended to be a standard specification for Soil Preparation for bid purposes only. The contractor shall be responsible for creating a suitable soil medium that ensures healthy plant growth. Immediately following rough grading operations, the contractor shall take multiple soil samples of the site to identify any chemical, structural, or other soil borne issues that would make the soil counterproductive to healthy plant growth. This analysis shall include recommendations for additional organic matter required for the soil. Should amendments or additional work be required to make these soils more conducive to healthy plant growth, the contractors shall submit a change order for the modification 30 days prior to start of landscape installation for Owner's Approval. The change order request shall clearly detail any additional work or amendments necessary for those unacceptable soils.
- B. Grades
 1. Inspect to verify rough grading is within +0.1 foot or 1/10" of grades indicated and specified.
- C. Damaged Earth
 1. Inspect to verify that earth rendered unfit to receive planting due to concrete, water, mortar, limewater, or any other contaminant dumped on it has been removed and replaced with clean earth from a source approved by the Owner's Representative.
- D. Cleanliness
 1. Inspect to verify that site is clean of all trash and debris.
- E. Equipment
 1. Inspect to verify other trades have removed all equipment and staging areas from areas of work.
- F. Unsatisfactory Conditions
 1. Report in writing to General Contractor with copy to Owner.

- G. Acceptance
 - 1. Beginning of installation means acceptance of existing conditions by installer.

3.2 PREPARATION

- A. Protection
 - 1. Locate sewer, water, irrigation, gas, electric, phone and other pipelines or conduits and equipment prior to commencing work.
 - 2. Be responsible for proper repair to landscape, utilities, walls, pavements, and other site improvements damaged by operations under this section.
- B. Weed Control
 - 1. Remove weeds by applying herbicide 1 week before soil preparation and as needed, but no sooner than 3 months before beginning work.
 - 2. If the area to be developed is infested with noxious or invasive weeds, a chemical application will be required, at a rate recommended on the chemical's product label.
 - 3. The contractor shall remove all weeds prior to tilling or spreading any soil amendments. All dead plant material shall be removed from the site and not tilled into the soil.
- C. Surface Grade
 - 1. Remove weeds, debris, clods, and rocks larger than 1". Dispose of accumulated debris at direction of owner or Owner's Representative.
- D. Runoff
 - 1. Take measures and furnish equipment and labor necessary to control the flow, drainage, and accumulation of water. Ensure that all water will run off the grades.
- E. Erosion Control
 - 1. Take measures and furnish equipment and labor necessary to control and prevent soil erosion, blowing soil and accumulation of wind-deposited material on the site throughout duration of work.
 - 2. No areas of the site may remain unprotected for more than 30 days, or as directed by the storm water management plan.
 - 3. The contractor shall assume maintenance and management responsibilities for erosion control in an area upon commencement of activities in that area. Erosion control practices must be compliant with the local jurisdiction rules and regulations, and any Storm Water Management Plans/Programs in place.
 - 4. The contractor will be expected to begin repair to damaged erosion control devices, siltation, wash outs, etc. within twenty-four hours of a storm event or upon notification by the Owner's Representative.

3.3 INSTALLATION

- A. Soil Amendment
 - 1. Evenly distribute topsoil, soil amendments, conditioners, and fertilizer, and first application of fertilizer in landscaped areas at the rates outlined in Part 2.01 of this Section.
- B. Mixing
 - 1. After applying soil conditioner, fertilizers, and compost thoroughly till area to depth of 6" minimum by tilling, plowing, harrowing, or disking until soil is well pulverized and thoroughly mixed.

- C. Fine Grading in all Landscape Areas:
 - 1. Do fine grading for areas prior to planting.
 - 2. For ground surface areas surrounding buildings to be landscaped, maintain required positive drainage away from buildings.
 - 3. Establish finish grades to within 0.1 foot of grades indicated.
 - 4. Fine grading must be inspected and approved by Owner's Representative.
 - 5. Any damage caused by inclement weather, to finish grades before inspection, will be repaired by the contractor, prior to acceptance by Owner's Representative.
 - 6. Sodded areas - Allow 1" for sod.
- D. Noxious weeds or parts thereof shall not be present in the surface grade prior to landscaping.
- E. Prior to acceptance of grades, hand rake to smooth, even surface free of debris, clods, rocks, and vegetable matter greater than 1".

3.4 FIELD QUALITY CONTROL

- A. Inspection
 - 1. Provide notice to Owner's Representative requesting inspection at least seven (7) calendar days prior to anticipated date of completion.
 - 2. The following required inspections will be conducted to ensure proper preparation of soil, prior to planting.
 - a. During, or after, the first cultivation
 - b. After the application of specified soil amendments.
 - c. During, or after, the second cultivation
 - d. After the final grades have been established
- B. Deficiencies
 - 1. Owner's Representative will specify deficiencies to Contractor who shall make satisfactory adjustments and shall again notify Owner's Representative for final inspection.

3.5 CLEANING

- A. Remove debris and excess materials from site. Clean out drainage inlet structures. Clean paved and finished surfaces soiled as a result of work under this Section, in accordance with direction given by Owner's Representative.

3.6 PROTECTION

- A. Provide and install barriers as required and as directed by Owner's Representative to protect completed areas against damage from pedestrian and vehicular traffic until acceptance by Owner. Contractor is not responsible for malicious destruction caused by others.

END OF SECTION 329113

SECTION 329219 - SEEDING

PART 1 - GENERAL

1.1 SUMMARY

- A. The Contractor must supply all material and labor necessary for installation of all types of seed noted on plans.
- B. The Contractor must produce a lush stand of grasses as defined in this section by the end of the second full growing season or establishment as dictated by local jurisdiction.

1.2 REFERENCES

- A. Reference Standards: Comply with U.S. Department of Agriculture Rules and Regulations under Federal Seed Act and be equal in quality to standards for Certified Seed.
- B. Refer to General Landscape Section
- C. Refer to Landscape Maintenance Section
- D. Refer to Fine Grading and Soil Preparation Section.

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements
 - 1. Permanent and Temporary Irrigated Seed Areas: This includes all areas within the limits-of-work that are seeded and irrigated. Contractor must inspect these areas every two (2) weeks for the presence of weeds. Areas require individual attention and separate maintenance schedules; thus, the Contractor is responsible for developing and sustaining a weed-free, lush stand of specified grasses. Chemical, mechanical, or manual methods must be implemented to prevent the spread of weeds. Mowing is the preferred method. Contractor is expected to re-seed areas as bare spots develop at the Contractor's expense. Bare spots must not exceed 8 inches square by the end of the first full growing season or as dictated by local jurisdiction.
 - 2. Non-irrigated Seeded Areas: This includes all areas within the limits-of-work that are seeded, and do not receive supplemental watering. Contractor must inspect these areas every two (2) weeks for the presence of weeds. Areas require individual attention and separate maintenance schedules; thus, the Contractor is responsible for developing and sustaining a weed-free, lush stand of specified grasses. Chemical, mechanical, or manual methods must be implemented to prevent the spread of weeds. Mowing is the preferred method. Contractor is expected to re-seed areas as bare spots develop at the Contractor's expense. Bare spots must not exceed 12 inches square by the end of the first full growing season or as dictated by local jurisdiction.
 - 3. Bidders must assume that all seed areas require an initial seeding followed by a second and third overseeding at Contractor's expense. The second and third overseeding must be drill seeded depending on the amount of coverage achieved in the first seeding attempt.
 - 4. Seeding must generally be completed in spring and fall. It may be necessary to alter the schedule or installation practices to ensure the seed is installed in spring or fall. For

- instance, it may be necessary to eradicate weeds and perform seeding prior to installing irrigation. Then install irrigation and repair the limited areas where lines were installed.
5. If seed installation occurs in the late summer or early fall, it may be required to perform the subsequent second and third seeding during the following spring. The second and any additional seeding shall not be a condition of Initial Acceptance but will be required when reviewing the performance of areas as part of the Final Acceptance.
 6. The contractor will be required to furnish all tags from bags of seed to demonstrate the proper rate and species were installed.

1.4 SUBMITTALS

- A. Refer to submittals in General Landscape Section.

1.5 PROJECT/SITE CONDITIONS

- A. Existing Conditions: Vehicular accessibility on site shall be as directed by Owner's Representative. The Contractor must repair damage to prepared ground and surfaces caused by vehicles during work under this section to prepared condition at no additional cost to Owner.
- B. Environmental Conditions: Do not drill or sow seed during windy weather, when ground is frozen, or when ground is not tillable.

1.6 WARRANTY & GUARANTEE

- A. At Initial Acceptance, furnish written warranty to Owner based upon requirements as specified.

1.7 MAINTENANCE

- A. The installation Contractor is responsible for the interim maintenance period. The interim maintenance period starts immediately after each area is seeded and continues until Initial Acceptance of the entire project. Final Acceptance of seeded areas will not be given until the Landscape Architect and / or local jurisdiction is satisfied with germination and a full stand of grass is in a vigorous growing condition, with consistency and completion of coverage. During this time, the installation Contractor is responsible for watering, mowing, spraying, weeding, fertilizing, and all related work as necessary to ensure that seeded areas are in a vigorous growing condition. Provide all supervision, labor, material, and equipment to maintain seeded areas.
- B. Constant, proactive maintenance of seeded areas and regular reviews of the performance are critical to the successful establishment of seeded areas. The Contractor must inspect the seeded areas during the interim maintenance period and the maintenance period and keep the seeded areas as weed free as reasonably possible. The Contractor may need to apply herbicides as frequently as a weekly basis on areas infested with weeds or areas where aggressive weeds are observed. Mowing may be a suitable method for weed management if it does not spread weed seeds. The Contractor must include a weed management program as part of their bid.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil

1. Topsoil must have an acidic reaction of 6.0 to 7.8 pH and must not include any minerals or elements detrimental to plant growth. Soluble salts measured in saturation extract shall be 5 mmhos/cm or less.
2. Topsoil preparation must be as described in Section 32 9110 Soil Preparation.

B. Booster Fertilizer

1. All fertilizer requirements must meet the requirements of Section 32 9110 Soil Preparation.
2. In all seeded areas a booster fertilizer with a ratio of approximately 5-15-1 must be applied on the prepared soil at the rate of five (5) pounds per one thousand (1,000) square feet immediately before seeding unless other requirements are identified from soils testing. The booster fertilizer must have a minimum acceptable nitrogen level of 15%, and minimum acceptable phosphorus level of 45%, with four (4) percent iron and eight (8) percent sulfur.
3. Seeded areas must receive an application of 800 pounds per acre of Forte Biosol (or approved equal) after seeding and before mulching.

C. Bluegrass, Fine Fescue, Tall Fescue, and Rhizomatous Tall Fescue Seed

1. Seed must be furnished in sealed, unopened, standard containers and labeled in accordance with the USDA Rules and Regulations and the Federal Seed Act. Seed must be fresh, clean, pure live seed equal in quality to the standards for Certified Seed. It must be capable of passing the USDA test for germination of eighty-five (85) percent and for purity of ninety (90) percent. Seed must be free of *Poa annua* and all noxious or objectionable weed and must have a maximum weed crop of one-tenth (0.1) percent. Seed must have been prepared for seeding during the year of installation and must have been stored away from high heat (over 100 degrees F). The Owner's Representative may require tests of seed verification at the Contractor's expense.
2. For seeded turf areas, all seed varieties used must be tested within the most recent National Turfgrass Evaluation Program (NTEP) list of varieties, preferably tested in the Intermountain West at either Logan UT, Sheridan WY, or other approved testing site for regional adaptability and approved by the Landscape Architect.

D. Native Seed

1. Seed must have been prepared for seeding during the year of installation and must have been stored away from high heat (over 100 degrees F).
2. Seed must be furnished in sealed, unopened, standard containers and labeled in accordance with the USDA Rules and Regulations and the Federal Seed Act. Seed must be fresh, clean, pure live seed equal in quality to the standards for Certified Seed.
3. Seed tags must be supplied to the Owner's Representative prior to installation for all seed mixtures, showing overall quantities and species. The Owner's Representative may require tests of seed verification at the Contractor's expense.

E. Top-dressing/Mulch

1. Hydromulch: Hydromulch is only allowed for seeded areas that will have temporary or permanent irrigation. Hydromulch must be a wood cellulose fiber type and must be applied at the minimum rate of two thousand five hundred (2,500) pounds per acre with a minimum rate of one hundred and fifty (150) pounds per acre tackifier and must be applied immediately after seed application.
 - a. Sterilized wood fiber made from mechanically defibrated whole wood chips, colored green with a non-toxic dye.

2. Straw: 75% of straw must consist of straws longer than ten (10) inches. Straw must be applied evenly over the seeded surface at the minimum rate of two (2) tons per acre and partially embedded into the soil using a crimper or similar implement. Tackifier shall be sprayed on straw after crimping for all non-irrigated seed areas due to potential wind uplift.
 3. Tackifier: Non-toxic, organic, starch based tackifier agent. Approved manufacturers are:
 - a. Rantec – Super Tack or R-Tack products: www.ranteccorp.com
 - b. Chemstar – StarTak 600 product: www.chemstar.com/environmental/
- F. Seed mixtures – refer to landscape plans for the rate and type.

2.2 SOURCE QUALITY CONTROL

- A. Inspection
1. To maintain quality other requirements are not waived even though visual inspection may result in acceptance.
 2. The Landscape Architect will inspect seeding at Initial Acceptance and at Final Acceptance. Additional inspections may be made at Owner's or Owner's Representative's request.
 3. Seed material is subject to submittal, inspection, and acceptance. The Owner's Representative reserves the right to reject any work and seed which in Owner's Representative's or local jurisdiction's opinion fails to meet specification requirements at any time or place prior to acceptance.
 4. Inspections on seeded areas will be for the following items:
 - a. Proper weed management and control (mechanical, chemical, mowing)
 - b. Germination and performance of desired grass species
 - c. Uniform coverage of desired grass species
 - d. Performance of the irrigation system (if present)
 - e. Watering practices (if applicable)
 - f. Erosion control and management practices
- B. Testing Requirements
1. Seed and seed labels shall conform to current State and Federal regulations and be subject to testing provisions of the Association of Official Seed Analysis.
 2. The Owner's Representative may require tests of seed verification at the Contractor's expense.
 3. All tags from seed bags must be retained by the Contractor and submitted to the Owner's Representative prior to installation to ensure the proper seed rate and seed mixtures were applied to areas. If seed tags are not submitted, it will be assumed that the area was improperly seeded, and the Contractor must apply a comprehensive herbicide to the space and reseed areas at the Contractor's expense.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that existing site conditions are as specified and indicated on construction documents before beginning work under this section.
- B. Layout: Verify layout of seeding areas as indicated prior to starting seeding operations.

- C. Grades: Inspect to verify that rough grading is within 0.1 foot or 1/10" of grades specified and indicated.
- D. Unsatisfactory Conditions: Report in writing to General Contractor with a copy to the Owner's Representative.
- E. Acceptance: Beginning of installation means acceptance of existing conditions by the Contractor.

3.2 PREPARATION

- A. Protection
 - 1. The Contractor is responsible for proper repair to landscape, utilities, fences, pavements, and other site improvements damaged by operations under this Section.
 - 2. The Contractor shall pay for repairs as determined by Owner.
 - 3. Identify seeding areas that require protection and erect barriers for proper protection and traffic control.
- B. Erosion Control
 - 1. Take measures and furnish equipment and labor necessary to control and prevent soil erosion, blowing soil, and accumulation of wind-deposited materials on the site throughout the duration of work.
 - 2. Existing BMPs for erosion control must be maintained during construction and during the maintenance period. This is the responsibility of the General Contractor once they begin work. Additional services will not be authorized for repairs to BMPs if damage is a result of the Contractor's neglect or activities.
- C. Seeding Areas
 - 1. Remove weeds, debris, and rocks larger than 1/2" which may hinder seeding or subsequent operations.
 - 2. Dispose of accumulated debris at direction of General Contractor.
- D. Fine Grading
 - 1. Perform as required to maintain positive drainage, prevent ponding, prevent direct run-off into catch basins and drainage structures, and as required to provide smooth, well-contoured surface prior to proceeding.
 - 2. Tolerance: +/- 0.04 foot within 50' of walks, roads, and high visibility areas. In large areas of open space that are intended to be natural in appearance, a "rougher grade" is more desirable.
- E. Soil Preparation
 - 1. Contractor must ensure that all areas receive proper and adequate soil preparation. Refer to Soil Preparation Section for field quality control measures.
 - 2. If the area to be developed is infested with noxious or invasive weeds, a chemical application is required at a rate recommended on the chemical's product label.

3.3 SEEDING

- A. Hydroseeding is not allowed.

B. Native Seeding

1. Seeding dates
 - a. Seeding of warm-season grasses is allowed between April 1st and June 15th without supplemental irrigation, and between April 1st and July 31st if adequate supplemental irrigation is present, as determined by the Owner's Representative.
 - b. Seeding of mixtures containing cool season grasses are allowed between August 1st and October 30th.
 - c. Dormant native seeding with standard mixtures of cool season and warm season grasses must occur between October 30th and April 30th.
 - d. Permission for exceptions to this seeding time must be obtained prior to seeding from the Owner's Representative.
 - e. Seeding is prohibited when the soil is frozen, snow covered, or excessively wet.
2. Drill seeding
 - a. Native seed must be applied using a native grass drill seeder equipped with a seed box agitator and depth bands. Seed must be sown to a depth of one-quarter ($\frac{1}{4}$) to one-half ($\frac{1}{2}$) inch into a properly prepared seedbed.
 - b. On sloping land, the seed shall be applied following the general contour.
3. Broadcast seeding
 - a. Broadcast seeding may be used in areas where drill seeding is not possible such as corners, near fences, along walkways, around posts or boxes associated with electric, gas, or irrigation installations, or other similar situations.
 - b. Hydroseeding is prohibited in all non-wetland seeded areas.
 - c. Seeded areas installed with the broadcast method must be uncompacted. The areas must be harrowed and mulched after seeding.
4. Mulch application
 - a. Seeded areas must be mulched with twenty-five hundred (2,500) pounds per acre hydromulch immediately following seeding.
 - b. Hydromulch must include one hundred and fifty (150) pounds per acre organic tackifier and provide 100% soil coverage.
 - c. The Owner's Representative may request the Contractor reapply mulch in thin areas where soil is visible until the coverage is satisfactory, at the Contractor's expense.
 - d. If weather conditions deteriorate, Contractor will delay work until conditions improve.
 - e. Mulch must be applied in a separate operation on the same day as seeding.
 - f. Hay is prohibited on the construction site for any purpose.
5. Cleanup
 - a. Remove all hydromulch from all plant materials, fences, concrete, and other areas except for seed bed.
 - b. Overly dense applications of straw mulch or windrows of loose straw mulch which may smother seedling grasses must be collected and removed.
 - c. Straw mulch blown offsite during the construction and maintenance period must be collected and removed by the Landscape Contractor responsible for the project.

C. Erosion Control Blankets

1. Erosion control blankets must conform to the Erosion Control Technology Council's "Standard Specifications for Rolled Erosion Control Products."
2. 'Short-term' blankets shall have up to 12-month functional longevity. Other duration products and longevities may be required for specific projects.
3. All erosion control blanket samples must be approved by the Owner's Representative or local jurisdiction prior to installation.
4. Apply erosion control netting to any area which is vulnerable to soil erosion such as swales or steep slopes (3:1 or steeper slopes). If the Contractor fails to net such areas and soil erosion subsequently occurs, the Contractor shall re-establish finish grade, soil preparation, seed bed, and apply jute netting at their own expense.
5. Roll erosion control blankets out in direction of surface flow after seeding and mulching.

6. Apply material loosely and smoothly on soil surface without stretching or tenting.
7. Avoid walking directly on seedbed either before or after material is applied.

3.4 RESEEDING

- A. Areas shall be reseeded if they exhibit bare areas greater than the acceptable amounts noted in Part 1 of this Section. Reseeding shall occur continually during the establishment period at Contractor's expense.

3.5 ADDITIONAL SEED VARIETIES

- A. Additional native and/or non-native seed varieties may be considered on a case-by-case basis. All varieties, mixtures, seed rates, and dates of application not within plans or specifications must be approved by the Landscape Architect or local jurisdiction prior to seeding.

3.6 MAINTENANCE PROCEDURES

- A. Maintenance Procedures for Native and Open Space Areas
 1. Maintenance period
 - a. The interim maintenance period starts upon installation and ends on the date of Initial Acceptance.
 - b. The maintenance period must be a minimum one (1) year period between Initial Acceptance and Final Acceptance or the extent of the warranty period, whichever is greater.
 - c. Extended warranty period may be required as determined by the Owner's Representative.
 - d. Seeded areas must be maintained in a weed free manner.
 - e. Weed infestations must be mowed or spot treated with approved herbicides starting upon installation and continuing through the maintenance period until Final Acceptance.
 - f. It is recommended that maintenance activities be reported regularly to the Owner's Representative, to assure a complete record of activities is on file in support of the Final Acceptance Inspection (at the closure of the one-year warranty period).
 2. Signage
 - a. The Contractor is responsible for providing and installing barriers as required to protect seeded areas from pedestrian and vehicular damage.
 - b. Provide signage and barricades as needed.
 - c. Any traffic damage that may occur prior to Final Acceptance of the work will be repaired and reseeded at the Contractor's expense, unless such damage is documented, received by Owner within seven (7) days, and proven to be the result of activities by others, outside of the Contractor's control.
 3. Litter removal
 - a. All litter or trash from construction sites or other sources which may blow onto Native and Open Space areas must be collected and removed from the area weekly to prevent smothering of establishing vegetation.
 4. Access
 - a. Vehicular traffic is prohibited on Native and Open Space areas, except for approved maintenance vehicles on established trails and sidewalks.
 - b. Mowing, re-seeding, and spray equipment are allowed off trails, but must avoid all access immediately following precipitation or irrigation events which may lead to rutting.

- c. All damage to irrigation installations must be repaired at the Contractor's expense, according to the specifications.
- 5. Weed Control Maintenance
 - a. Annual weeds must be mowed when they exceed 12 inches in height.
 - b. Rotary mowers must be used for mowing operations.
 - c. Dense accumulations of mowed weeds must be collected to prevent smothering of desired vegetation.
 - d. Mowing is required at least twice (late May and late August) during normal years and could require mowing more frequently in wet years or if the site is heavily irrigated.
 - e. State listed noxious weeds or other problematic weedy species of concern (some of which are listed below) shall be spot treated with approved herbicides with approved application methods at approved times for effective control, at least twice each year.
 - f. For acceptable results, most of these species should be sprayed during late May/early June and again in late August/September.
 - g. Other non-native weedy species of concern include, but may not be limited to:
 - (i) Common (or great) mullein (*Verbascum thapsus*)
 - (ii) Thistles (including Bull, Canada, Scotch and Musk Thistles)
 - (iii) Purple Loosestrife (*Lythrum salicaria*)
 - (iv) Field Bindweed (*Convolvulus arvensis*)
 - (v) Blue Mustard (*Chorispora tenella*)
 - (vi) Diffuse Knapweed (*Centaurea diffusa*)
 - (vii) Kochia (*scoparia*)
 - (viii) Curly dock (*Rumex crispus*)
 - (ix) For a full listing of problematic weeds which must be eradicated or controlled, refer to the most recent edition of 'Noxious Weeds of Colorado,' using Lists A, B, and C.
 - h. Herbicide selection, concentration, and timing of application must be approved by the Owner's Representative prior to application.
 - i. Broadcast application of herbicides with boom sprayers is prohibited unless approved by the Owner's Representative in writing.
 - j. Spot treatment of weeds with spray guns on 4 wheelers or back packs is acceptable.
 - k. Permission must be obtained from the Owner's Representative for exception to this specification.
- 6. Irrigation
 - a. The Contractor is responsible for temporary irrigation (where shown on irrigation plans) on all native seed areas and for water usage until such time as the seeding is established and accepted.
 - b. The Contractor is responsible for initial watering of the native seeded area and for keeping the area sufficiently moist until seed is established per this specification.
 - c. Over watering can be detrimental to the success of native seed establishment. Areas where seed fails to establish due to over or under watering must be reseeded and re-mulched at Contractor's expense.
 - d. Assistance in preparation of site-specific irrigation schedule for native seed areas is available from the Landscape Architect upon request.
 - e. General recommended watering schedule for native seeded areas is shown below. Watering prior to this schedule is weather dependent and based on best management practices.

WEEKS AFTER SEEDING	FREQUENCY	DURATION	TIMING
first month, or until initial germination (May or June)	2 times per day	15 minutes or until soil is moist to 1 inch depth	10 AM, 10 PM (to provide extended period of soil moisture at night)
4-6 weeks	2 times per week	20 minutes or until soil is moist to 2-inch depth	10 PM (after evening winds subside)
7-10 weeks	1 time week	30 minutes or until soil is moist to 3-inch depth.	10 PM (after evening winds subside)
11 weeks to late September	every other week	30 minutes or until soil is moist to 3-inch depth	10 PM (after evening winds subside)

7. Established Native Seed Area Requirements:
- a. Seeded areas are warranted for consistency and completion of coverage.
 - b. At least six (6) desirable seeded plant seedlings per square foot or as dictated by local jurisdiction.
 - c. All bare areas over ten (10) square feet in size shall be re-seeded and re-mulched at the Contractor's expense.

8. Interim maintenance and maintenance period seeding maintenance requirements:

ACTIVITIES	SEASONAL FREQUENCY	APPROXIMATE DATES	COMMENTS
Installation protection	Keep initial installation repaired	As required	Install fencing and signage to prevent unauthorized vehicle access and disturbance to seeded and planted areas. Maintain fencing and signage on preserved remnant areas and trees.
Collect wind drift of straw mulch	After initial installation and before germination	As required before germination	Incompletely crimped straw mulch may blow into dense drifts which can smother seeded areas. Check for these and remove excess straw prior to germination.
Litter collection	Collect litter to prevent smothering	As required	Collect construction or other litter which blows onto open space to prevent smothered vegetation and repairs. Placing an orange fence between construction site and the edge of open space may help concentrate litter off the vegetation and reduce clean up time.
Repair seeded or planted areas damaged by irrigation malfunction, tire ruts, erosion		As required	Construction damage to open space vegetation shall be repaired immediately.
Annual weed control	Two or more times per growing season	Late May to early June and again in late August to early September	Annual weeds, including Annual ryegrass, Russian thistle, and Kochia should be mowed when they exceed 12 inches in height. Mowing is necessary at least twice a year for two years. More frequent mowing could be needed in wet years. Do not mow when the site is muddy to prevent ruts and repairs.
Noxious weed control	Two or more times per growing season	Late May to early June and again in late August to early September	Several species of noxious weeds occur in the area: Canada thistle, Musk thistle, Scotch thistle, Diffuse knapweed, Blue mustard. All noxious species that occur on the development site must be treated twice a year with the proper concentration of effective chemicals, with the proper equipment, at the correct times to receive full credit for the warranty period. Consult a certified weed control specialist for best results.
Irrigation	See irrigation table in Standards and Specifications	May through September of first year following winter to early spring seeding	Temporary irrigation during establishment is required for native seeding where irrigation is provided.
Reporting activities	Regularly	As completed	To assure full credit for proper warranty period activities, it is recommended that regular reports for all required one year warranty maintenance activities be filed with the Owner's Representative to provide a complete record for consultation during the Final Acceptance Inspection. Regularly submitted reports help prove due diligence.

9. Inspections
 - a. The Contractor must notify the Owner's Representative for inspections of seed certification.
10. Inspection of Seed Certifications
 - a. Seed certification tags shall be delivered to the Owner's Representative prior to installation to verify compliance with these standards and specifications.

END OF SECTION 329219

SECTION 329223 - SODDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all supervision, labor, material, equipment, transportation, permits and fees, and perform all operations in connection with the installation of sod, where called for in plans and specifications.

1.2 REFERENCES

- A. Reference Standards: U.S. Department of Agriculture Rules and Regulations under Federal Seed Act and equal in quality to standards for Certified Seed.
- B. General Landscape Section
- C. Soil Preparation Section

1.3 SUBMITTALS

- A. Refer to General Landscape Section.

1.4 QUALITY ASSURANCE

- A. Sod Materials
 - 1. Subject to submittal approval, inspection, and acceptance. Owner's Representative reserves the right to reject at any time or place prior to acceptance, any work and sod which in the Owner's Representative's opinion fails to meet these specification requirements. Promptly remove rejected sod from site if directed by Owner or Owner's Representative and at Contractor's expense.
 - 2. Sod materials submittal shall be made and approved by Landscape Architect prior to the commencement of any sodding activities.
- B. Inspection
 - 1. Inspection will be made periodically during sodding, at Initial Acceptance and at Final Acceptance by Landscape Architect.
 - 2. Inspection shall be scheduled prior to sodding. Owner's Representative will inspect finish grades on which sod will be laid. This inspection does not dismiss the Contractor's responsibility for creating positive drainage across the landscaped areas.
- C. Sod Standards
 - 1. General - Healthy, thick turf having undergone a program of regular fertilization, mowing, and weed control; free of objectionable weeds; uniform in green color, leaf texture and density; healthy, vigorous root system; inspected and found free of disease, nematodes, pests, and pest larvae by the entomologist of the State Department of Agriculture.
 - 2. Each piece of Sod - Sandy-loam soil base that will not break, crumble, or tear during sod installation.
 - 3. Thickness – 5/8" minimum root zone thickness.

4. Thatch - Not to exceed ½" uncompressed.
5. Size - Cut in strips 18" wide no more than 24 hours prior to delivery.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping
 1. Deliver on sod on pallets properly loaded on vehicles and with root system protected from exposure to sun, wind, and heat in accordance with standard practice and labeled with botanical and common name of each grass species in accordance with Federal Seed Act.
 2. Protect sod from dehydration, contamination, and heating always. Keep stored sod moist and under shade or covered with moistened burlap.
 3. Do not drop sod rolls from carts, trucks, or pallets.
- B. Acceptance at Site
 1. Material shall be inspected upon arrival at job site.
 2. Immediately remove unacceptable material from job site.
- C. Storage and Protection
 1. Do not stack sod more than 2 feet deep.
 2. Do not deliver more sod than can be installed within 24 hours. Storage is not recommended.

1.6 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
 1. Do not install sod on saturated or frozen soil.
- B. Existing Conditions
 1. Import and place any fill material required to adjust the fine grade to meet drainage requirements or to match hard surface fine grades, or as indicated on Grading Plans (e.g., 1 inch lower than adjacent concrete trails).
 2. Vehicular accessibility on site shall not be allowed unless directed by Owner's Representative. Repair damage to prepared grounds and surfaces caused by vehicular movement during work under this section to original condition at no additional cost to Owner.

1.7 WARRANTY & GUARANTEE

- A. Warranty sod for a period of one year from date of Initial Acceptance be in a healthy, vigorous growing condition.
- B. During the maintenance period, replace at once sod areas that die due to natural causes, are unhealthy, etc.
- C. Replacement will not be required between October 15 and April 15.
- D. Install replacement sod as originally specified and warranted.

1.8 MAINTENANCE

1. The interim maintenance period shall begin immediately after each area is sodded and continue until date of Initial Acceptance of entire project. During this time, the contractor shall, be responsible for watering, mowing, spraying, weeding, aerating, fertilizing, and all related work as necessary to ensure that sodded areas are in a vigorous growing condition. Furnish all supervision, labor, material, and equipment to maintain turf areas.
2. The maintenance period shall begin on the date of Initial Acceptance of entire project and continue until midnight on the date of Final Acceptance. During this time, the contractor shall, be responsible for watering, mowing, spraying, weeding, aerating, fertilizing, and all related work as necessary to ensure that sodded areas are in a vigorous growing condition. Furnish all supervision, labor, material, and equipment to maintain turf areas.
3. When installation Contractor performs the full maintenance period, Contractor shall be responsible for any warranty items.
4. When General Contractor or Owner accepts an installation contract that does not include the full maintenance period or hires a separate Contractor to perform maintenance during the maintenance period, the installation warranty shall be 30 days for the installation Contractor commencing from the date of Initial Acceptance.

1.9 WATERING

- A. Initially water sod upon completion of work areas consistent with irrigation zones until installation is complete and the irrigation system can be operated under full control. Water sod sufficiently to moisten subsoil at least 4" deep in a manner not to cause erosion or damage to adjacent finished surfaces. Water shall be free of substances harmful to plant growth. Contractor is responsible for furnishing water from underground sprinkler system, quick couplers, or other source to ensure survival of sod.
- B. Contractor shall know, understand, and abide by all local water restrictions, if in effect.
- C. Contractor will be held responsible for any fines received for violating any watering restrictions in effect, at Contractor's expense.
- D. The Contractor shall attempt to provide the minimum water necessary to maintain irrigated landscape areas, especially in times of drought and during summer months.
- E. Re-sodding
 1. Re-sod spots larger than nine inches square or per local jurisdiction, and not having healthy, uniform stand of grass.
- F. Insect and Disease Control:
 1. As required, using insecticides and fungicides approved by Owner or Owner's Representative.

PART 2 - PRODUCTS

- A. Refer to the Landscape Plans.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General
 - 1. Verify that existing site conditions are as specified and indicated before beginning work under this section.
- B. Layout
 - 1. Verify layout of sodded areas as indicated prior to starting operations.
- C. Grades
 - 1. Contractor shall inspect finished grades prior to installing any sod.
- D. Unsatisfactory Conditions
 - 1. Report in writing to General Contractor with copy to Owner's Representative.
 - 2. Beginning of installation means acceptance of existing conditions by this Contractor.

3.2 PREPARATION

- A. Protection
 - 1. Pay for repairs made by contractors designated by Owner.
 - 2. Identify prepared sod areas requiring protection and erect barriers for proper protection and traffic control.
- B. Sodding Areas
 - 1. Remove weeds, debris, and rocks larger than ½" which may hinder sodding. Dispose of accumulated debris off-site in approved legal dump site, or in a location pre-approved by the General Contractor or Owner.
- C. Repair
 - 1. Re-establish grade and specified conditions to damaged sod areas prior to placing sod. Receive final approval from General Contractor after grading operations and prior to placing sod.
- D. Adjustment
 - 1. Adjust irrigation heads to proper watering height according to depth of sod material but lower than compacted blade height to enable lawn mowers to cut grass freely without damage to the sprinkler system.
- E. Weeding
 - 1. If the area to be developed is infested with noxious or invasive weeds, a chemical application will be required, at a rate recommended on the chemical's product label.
- F. Fine Grading
 - 1. Perform as required to maintain positive drainage, prevent ponding and direct run-off into catch basins, drainage structures, etc., and as required to provide smooth well-contoured surface prior to proceeding. Tolerance: ± 0.04 foot.
 - 2. Unless noted on plans, tree lawns, or areas between curb and sidewalk, shall exhibit positive drainage towards the street. "Crowning," berming, or anything other than straight grading between these surfaces shall be rejected, unless otherwise waived by owner or owner's representative.

3. Fine grading must be approved by both Contractor and General Contractor prior to sodding. Contractor should provide at least two (2) calendar days' notice for inspection. Sod shall be installed within 48 hours of inspection. The Contractor will be responsible for repairing any grades damage by inclement weather, before or after finish grades are inspected.

3.3 SODDING

- A. Sodding
 1. Soil on which sod is laid should be slightly moist.
 2. Lay with longest dimension parallel to contours and in continuous rows.
 3. Tightly butt ends and sides of sod together. Stagger and compact vertical joints between sod strips by rolling so sod will be incorporated with the ground surface, insuring tight joints between adjacent pieces.
 4. Where new sod meets existing, cut existing with sod cutter to insure a tight joint and smooth transition between new and existing turf cover.
- B. Rolling
 1. When soil and sod are moist, roll sod lightly as soon as possible after it is laid. Delay rolling until just before the second watering.
- C. Topsoil
 1. Add along exposed edges to match adjacent grade. Feather topsoil out approximately 1 ft. from edge of sod.
- D. Drainage
 1. Assure finished areas of sod are such that positive drainage of storm and irrigation water will occur and ponding of water does not occur per Grading Plans.

3.4 REPAIR OF EXISTING SOD AREAS DISTURBED BY RENOVATION

- A. Repair existing sod areas disturbed by renovation work (utilities, paving, etc.) in accordance with these specifications to satisfaction of Owner.
- B. Add topsoil and re-sod as necessary to eliminate tire ruts and other depressions.

3.5 NOTIFICATION OF INSPECTION

- A. Notification
 1. Give notice requesting inspection by Owner's Representative at least seven (7) calendar days prior to the anticipated date of completion. All sod must be healthy and significantly rooted in place to be considered complete.
- B. Deficiencies
 1. If deficiencies exist, Owner's Representative shall specify such deficiencies to the Contractor who shall make satisfactory adjustments and will again notify the Owner's Representative for final inspection.

3.6 CLEANING

- A. Remove pallets, unused sod, and other debris from site. Clean paved and finished surfaces soiled as a result of work under this Section in accordance with directions given by Owner's Representative. Clean out drainage inlet structures.

3.7 PROTECTION

- A. Provide and install barriers as needed or required and/or as directed by Owner's Representative, to protect sodded areas against damage from pedestrian and vehicular traffic until Initial Acceptance by Owner. Contractor, at Contractor's expense, is responsible for malicious destruction of sodding caused by others until Final Acceptance unless fully documented and received by Owner within seven (7) days of said damage.

END OF SECTION 329223

SECTION 33 41 10
STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes pipe materials and accessories normally used with gravity storm drainage sewers.
- B. Section includes:
 - 1. Storm drainage piping
 - 2. Piping accessories
 - 3. Connection to existing manholes
 - 4. Catch basins and area drains
 - 5. Cleanouts
 - 6. Bedding and cover materials
- C. Related Sections:
 - 1. Section 31 05 13 - Soils for Earthwork
 - 2. Section 31 05 16 - Aggregates for Earthwork
 - 3. Section 31 23 16 - Excavation
 - 4. Section 31 23 23 - Fill

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.
 - 2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International (ASTM):
 - 1. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
 - 3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - 5. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
 - 6. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
 - 7. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
 - 8. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 9. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
 - 10. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 11. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
 - 12. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - 13. ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

C. American Water Works Association (AWWA):

1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
5. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.

D. Colorado Department of Transportation (CDOT):

1. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.3 COORDINATION

- A. Notify affected utility companies at least 72 hours prior to construction.

1.4 SUBMITTALS

- A. In accordance with Section 01 33 00, Submittal Procedures.
- B. Product Data: Submit Manufacturer catalog cuts and other information indicating proposed materials, accessories, details, and construction information.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements. The certificate shall be signed by an authorized agent of the Manufacturer.
- D. Test and Evaluation Reports: Submit reports indicating field tests made and results obtained.
- E. Manufacturer Instructions:
1. Indicate special procedures required to install specified products.
 2. Submit detailed description of procedures for connecting new storm sewer to existing storm sewer line or structure.
- F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record invert elevations and actual locations of pipe runs, connections, manholes, and cleanouts.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in Manufacturer's original packaging and inspect for damage.
- B. Storage:
1. Store materials according to Manufacturer instructions.
- C. Protection:
1. Protect materials from moisture, dust, and direct sunlight by storing in clean, dry location remote from construction operations areas.
 2. Block individual and stockpiled pipe lengths to prevent moving.
 3. Provide additional protection according to Manufacturer instructions.

1.7 EXISTING CONDITIONS

- A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Polyvinyl Chloride (PVC) Pipe:

1. Material:
 - a. Manufactured from rigid polyvinyl chloride compounds conforming to ASTM D1784, Class 12454.
2. Pipe and fittings 4 inches to 15 inches in diameter, non-pressurized:
 - a. Comply with ASTM D3034, SDR 35.
3. End Connections: Bell and spigot style, with rubber-ring-sealed gasket joint.
4. Joints:
 - a. Integral bell push-on type: Comply with ASTM D3212.
5. Gaskets:
 - a. Factory installed.
 - b. Elastomeric gaskets: Comply with ASTM F477.

B. Ductile Iron Pipe:

1. Comply with AWWA C151.
2. Minimum Special Thickness Class: 52.
3. End Connections: Bell and spigot or plain, as shown in the Drawings.
4. Outside Coating:
 - a. Type: Asphaltic coating, minimum 1-mil uniform thickness.
 - b. Comply with AWWA C151.
5. Lining:
 - a. Cement mortar lined.
 - b. Comply with AWWA C104.
6. Fittings:
 - a. Material: Ductile iron.
 - b. Comply with AWWA C153 or AWWA C110.
 - c. Lining: Cement-mortar lined according to AWWA C104.
7. Coating:
 - a. Asphaltic exterior coating in accordance with AWWA C151.
8. Joints:
 - a. Rubber gasket joint devices.
 - b. Comply with AWWA C111.

C. High Density Polyethylene (HDPE) Pipe:

1. Double wall, ribbed pipe with smooth interior.
2. Solid pipe, perforated pipe, and fittings shall meet the requirements of ASTM F 405 and F 667.
3. Pipe 3 inches to 10 inches in diameter: Comply with AASHTO M 252.
4. Pipe 12 inches to 60 inches in diameter: Comply with AASHTO M 294.
5. Joints: Integral bell push-on type.
6. Manufacturers:
 - a. ADS, N-12 with ProLink joints, or equal.

2.2 FLEXIBLE COUPLINGS

A. Description:

1. Resilient chemical-resistant elastomeric polyvinyl chloride (PVC) coupling.
2. Attachment: Two Series 300 stainless-steel clamps, screws, and housings.

2.3 FLEXIBLE PIPE BOOT FOR MANHOLE PIPE ENTRANCES

A. Description:

1. Material: Ethylene propylene rubber (EPDM).
2. Comply with ASTM C923.
3. Attachment: Stainless-steel clamp and hardware.

2.4 CATCH BASINS AND AREA DRAINS

A. Construction:

1. Material: HDPE Pipe Sections.

B. Grate:

1. Materials: HDPE.
 - a. UV resistant.
 - b. Removable.
 - c. Design: Linear grill.
2. Nominal Lid and Frame Size: As shown in the Drawings.

2.5 MATERIALS

A. Bedding and Cover:

1. Pipe Bedding and Pipe Zone Backfill:
 - a. Solid Wall Pipe: Coarse Aggregate Material Type A1, as specified in Section 31 05 16, Aggregates for Earthwork.
 - b. Perforated Pipe: Filter Material as specified in Section 31 05 16, Aggregates for Earthwork.
2. Trench Backfill from Pipe Zone to Finish Grade:
 - a. Material type varies by location, as shown in the Drawings.
 - b. Coarse Aggregate Material Type A1, as specified in Section 31 05 16, Aggregates for Earthwork.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut, or excavation base is ready to receive Work.
- B. Verify that excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

- A. Remove large stones or other hard materials that could damage pipe or impede consistent backfilling or compaction.
- B. Protect and support existing sewer lines, utilities, and appurtenances.
- C. Utilities:
 1. Maintain profiles of utilities.
 2. Coordinate with other utilities to eliminate interference.
 3. Notify Engineer if crossing conflicts occur.

3.3 INSTALLATION

A. Bedding:

1. Excavate pipe trench as specified in Standard Specification section **603.04**.
2. Excavate to lines and grades as indicated on Drawings, or as required to accommodate installation of utility.
3. Pipe base shall be observed by Engineer prior to placement of the pipe.
4. Dewater excavations to maintain dry conditions and to preserve final grades at bottom of excavation.
5. Placement:
 - a. Place bedding material at trench bottom.
 - b. Level materials in continuous layer not exceeding 6 inches compacted depth.
 - c. Compact to 95 percent of the Standard Proctor maximum density by AASHTO T-99.

B. Piping:

1. Install pipe, fittings, and accessories according to standards listed below, and seal joints watertight.
 - a. PVC, HDPE, ABS: Comply with ASTM D2321.
 - b. Ductile Iron: Comply with AWWA C600.
2. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.
3. Lay pipe to slope gradients and line as indicated on drawings.
4. Variations:
 - a. Maximum Variation from Indicated Line: 1/32-inch per inch of pipe diameter, but no more than 1/2-inch, providing that such variation does not result in a level or reverse-sloping invert.
 - b. Maximum Variation from Indicated Grade: 1/32-inch per inch of pipe diameter, but no more than 1/4-inch.
 - c. Variation in the invert elevation between adjoining ends of pipe, include fittings, shall not exceed 1/64-inch per inch of pipe diameter, or 1/2-inch maximum.
5. Begin at downstream end and progress upstream.
6. Assemble and handle pipe according to Manufacturer's instructions, except as may be modified on Drawings or by Engineer.
7. Make straight field cuts without chipping or cracking pipe.
8. Keep pipe and fittings clean until Work has been completed and accepted by Engineer.
9. Assemble pipe joints in accordance with Manufacturer's recommendations/specifications.
10. Cap open ends during periods of Work stoppage.
11. Lay bell and spigot pipe with bells upstream.
12. Backfill and compact as specified in Standard Specifications section **603.09**.
13. Do not displace or damage pipe when compacting.

C. Joints:

1. Just prior to joining the pipes, the surfaces of the joint rings shall be wiped clean, and the joint rings and rubber gaskets shall be liberally lubricated with an approved type of vegetable oil soap.
2. The spigot end, with the gasket placed in the groove, shall be entered into the bell of the pipe already laid, making sure that both pipes are properly aligned.
3. Before the joint is fully "home," the position of the gasket in the joint shall be determined by means of a suitable feeler gauge supplied by the Pipe Manufacturer.
4. If the gasket is found not to be in proper position, the pipes shall be separated, and the damaged gasket replaced.
5. The pipe is then forced "home" firmly and fully.

6. In its final position, the joint between the pipes shall not be deflected more than 1/2-inch at any point.
- D. Connection to Existing Manholes:
1. Drilling:
 - a. Core drill existing manhole to clean opening.
 - b. Use of pneumatic hammers, chipping guns, and sledgehammers are not permitted.
 2. Install watertight neoprene gasket and seal with non-shrink concrete grout.
 3. Prevent construction debris from entering existing sewer line when making connection.
- E. Wye Branches and Tees:
1. Concurrent with pipe-laying operations, install wye branches and pipe tees at locations indicated on Drawings.
 2. Use standard fittings of same material and joint type as sewer main.
- F. Area Drains
1. Install per manufacturer's recommendations.
- G. Backfilling:
1. Backfill around sides and to top of pipe as specified in Section 31 23 23, Fill.
 2. Maintain optimum moisture content of bedding material as required to attain specified compaction density.

3.4 FIELD QUALITY CONTROL

- A. Request inspection by Engineer prior to and immediately after placing bedding.
- B. Testing:
1. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.
 2. Compaction Testing: See Section 31 05 13, Soils for Earthwork for Compaction Testing requirements for piping trenches.

3.5 PROTECTION

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 49 24
BIORETENTION POND

PART 1 GENERAL

1.1 SCOPE

This Section consists of construction of a bioretention pond for stormwater quality control.

1.2 RELATED SECTIONS

- A. Section 31 10 00, Site Clearing
- B. Section 31 22 13, Rough Grading
- C. Section 31 23 16, Excavation
- D. Section 31 23 18, Rock Removal
- E. Section 31 37 00, Rip Rap

1.3 REFERENCES

- A. Mile High Flood District (MHFD) Construction Specifications and Criteria Manual

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Materials Source: Submit name of imported materials suppliers.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- D. Results of aggregate sieve analysis and standard proctor tests for all granular material.

PART 2 MATERIALS

2.1 BIO RETENTION POND

- A. All materials to be incorporated into the bioretention pond shall be in accordance with Table B-1 of the Mile High Flood District's Treatment BMP Fact Sheets: T-3 Bioretention.

PART 3 EXECUTION

3.1 PREPARATION

- A. Preparation of the bioretention pond shall be in accordance with the Construction Considerations section of the Mile High Flood District's Treatment BMP Fact Sheets: T-3 Bioretention

3.2 UNDERDRAIN

- A. In accordance with **Section 33 46 00** of the Mile High Flood District Construction Specifications.

3.3 MAINTENANCE

- A. Maintain the bioretention pond until accepted. Replace or repair any material displaced by any cause at no additional cost to the owner.

END OF SECTION