

City of Fruita

Department of Public Works
Engineering Division

Bid Documents and Construction Specifications for

Reed Park Improvements Project

CIP Project #130-795-77-4730



FRUITA

COLORADO

September 18, 2023

City of Fruita

Department of Public Works
Engineering Division

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Reed Park Improvements Project

CIP Project #130-795-77-4730

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City of Fruita

Department of Public Works
Engineering Division

Reed Park Improvements Project CIP Project #130-795-77-4730

3. Bid Instructions

Bidding Instructions

PROJECT: **Reed Park Improvements Project**

OWNER: City of Fruita
325 E. Aspen
Fruita Colorado 81521
Phone: (970) 858-8377
Fax: (970) 858-0210

PROJECT MANAGER: Sam Atkins

These Instructions are general in nature, and may be amended or supplemented by the City. By submitting a Bid, the Offeror warrants that it is familiar with all provisions of the Bid Instructions, Bid Schedule, the Drawing Set, Construction Specifications, Special Provisions, and the Draft Construction Contract, and agrees to comply with them. **Bid submittal requirements are listed in Section 8 below.**

1.0 General Scope of Work

This project consists of the removal and modification of existing concrete, asphalt and park facilities and the installation of new recreation & pedestrian improvements, utilities and pavement, a skate/wheel park and shelter/restroom facilities. Work includes, but is not limited to, installation and maintenance of traffic control and storm drain inlet protection, removal of existing asphalt, concrete, underground utilities, an existing restroom structure and existing landscaping and trees; procurement and installation of concrete drain pan, curb, gutter and sidewalk, concrete pavement, asphalt pavement, sewer, water, irrigation and drainage utilities, a stormwater pump system, rest room and shelter foundations and structures, playground facilities, wheel/skate park concrete and features, including related excavation, and trees/landscaping as shown on construction plans.

2.0 Form of Bid and General Description of Bid and Award Process

The Bid Schedule is attached to these Instructions. In general, work tasks such as mobilization, testing, and field survey work will be bid and paid on a fixed price lump sum basis. Most other items will be bid and paid on a unit price basis. Estimated quantities are shown on the Bid Schedule. Actual quantities may be either more or less than those shown on the Bid Schedule. Unit Pricing for all unit price items provides a basis of payment for changes in quantities associated with the relevant work tasks.

A Mandatory Pre-Bid Meeting will be held on Friday October 6 at 1:30 PM at the Fruita Civic Center located at 325 E. Aspen Avenue in Fruita, Colorado. Following the pre-bid meeting a site walk-through with city staff will occur. This walk-through is not considered mandatory.

All questions requiring a response prior to the bid opening shall be submitted in writing (email is acceptable) prior to **12:00 Noon on Wednesday October 11**. An Addendum addressing questions and clarifications will be issued **by the end of day on Thursday**

October 12. Please note, there may be addenda that are issued prior to that date so be sure to download and acknowledge all current contract documentation.

Sealed Bids will be opened at **1:30 PM on Friday October 13** at the Fruita Civic Center. Evaluation of the bids and selection of a winning bid will be based strictly on the lowest cost, responsive and responsible, Base Bid. Please see section 8.0 for a description of required submittals for determining responsiveness. Any bid deemed non-responsive will be eliminated from further consideration and the bid will not be read. Responsive bids will have their Base Bid read aloud.

The City expects to issue a Notice of Award by the end of day on **Friday, October 20** and have a signed Contract by **the following week**. The Pre-Construction Meeting will be scheduled as soon as possible following the Notice To Proceed.

A Draft Construction Contract is included in the Bid materials. Bidders must provide any objections or suggested changes in contract language at the time of bid opening. The City will negotiate and finalize contract language with the successful low bidder, issue a Notice To Proceed, and hold a Pre-Construction Meeting as soon as a Contract is signed and Performance and Payment Bonds are received.

While it is the intention of the City to award and construct the entire project as reflected by the Base Bid, the City reserves the right to delete work or reduce quantities, select alternatives, and/or otherwise modify the scope of work, either prior to or after Contract execution. This will not change the selection process.

3.0 General Description of Construction Process and Site Specific Requirements

Immediately after the Notice To Proceed, Contractor shall prepare a proposed construction schedule and submit it to the City Project Manager for approval. A Pre-Construction meeting shall be held after the Notice To Proceed with the General Contractor's Project Manager and Field Supervisor(s), City Project Manager, City Public Works Director, Materials Testing Firm, and any other major subcontractors desired by the General Contractor.

4.0 Schedule of Bid and Construction Activities

The tentative schedule of project activities including construction is included in the **Special Provisions**.

5.0 Addenda

Any interpretations, corrections, or changes to these Bidding Instructions, the Scope of Services, or extensions to the bidding deadlines or other dates will be made by a written Addendum to the Bidding Instructions by the Project Manager, who shall have sole authority to issue and authorize addenda. Addenda will be added to the Bidding Instructions retained at City Offices, and emailed to all firms who have picked up Bid Packets or provided the City with their email if the Bid Packets were obtained on line. All addenda shall be acknowledged on the Bid Schedule.

All questions about the meaning or intent of the Bidding Instructions are to be submitted in writing to the Project Manager (faxes or emails are acceptable). Interpretation or

clarifications deemed necessary by the City in response to such questions will be issued by addenda faxed or emailed to all parties recorded by the City as having received Bidding Instructions. Questions received after the deadline listed in Section 2 Form of Bid and General Description of Bid and Award Process above will not be answered prior to the bid opening. Only questions answered by formal written addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

6.0 Exceptions and Substitutions

Offerors are responsible for reviewing these Bidding Instructions and the attached Draft Construction Contract in their entirety. Offerors may take exception to any provision contained therein, but do so at their own risk. The City reserves the right to accept or reject any or all exception, substitution, or alternative. When offering an exception, substitution, or alternative, Offeror shall state these exceptions on a separate sheet of paper.

7.0 Confidential Materials

All materials submitted in response to this RFP will become public record in accordance with the Open Records Act and will be subject to inspection after contract award, with the following exceptions:

- a. Company Financial Disclosures
- b. Confidential Proprietary Information. Any information requested to be considered as Confidential Proprietary Information must be clearly identified as a “**Confidential Disclosure**”, be placed in a separate envelope, and include a justification for the request. Neither Unit Prices nor the total bid will be considered confidential or proprietary.
- c. All bids, excluding any confidential materials, become the property of the City of Fruita upon receipt, and will only be returned to the Offeror at the City’s option.

8.0 Required Submittals

- a. Each Bid shall contain a completed and signed Bid Schedule. Bid Schedules will not be considered complete unless all spaces for inserting either unit prices or total prices are filled in. Lump Sums and Unit Costs will be considered contractual obligations. The total Base Bid will be used for bid comparison purposes in determining the lowest responsive bidder. Any blank on the Bid Schedule that is not filled in with a number shall be assumed to be zero.
- b. The Bid Schedule shall be signed by a principal of the company having the authority to enter into contractual relationships on behalf of the company.
- c. Each Bid shall include a copy of insurance certificates or other evidence of the following minimum insurance requirements:

- i. Workers' Compensation insurance to cover obligations imposed by the Workers' Compensation Act of Colorado and any other applicable laws for any employee engaged in the performance of Work under this contract, and Employers' Liability insurance with minimum limits of FIVE HUNDRED THOUSAND DOLLARS (\$500,000) each accident, FIVE HUNDRED THOUSAND DOLLARS (\$500,000) disease - policy limit, and FIVE HUNDRED THOUSAND DOLLARS (\$500,000) disease - each employee.
 - ii. Comprehensive General Liability insurance with minimum combined single limits of ONE MILLION DOLLARS (\$1,000,000) each occurrence and ONE MILLION DOLLARS (\$1,000,000) aggregate. The policy shall be applicable to all premises and operations. The policy shall include coverage for bodily injury, broad form property damage (including completed operations), personal injury (including coverage for contractual and employee acts), blanket contractual, independent contractors, products, and completed operations. The policy shall include coverage for explosion, collapse, and underground hazards. The policy shall contain a severability of interests provision.
 - iii. Comprehensive Automobile Liability insurance with minimum combined single limits for bodily injury and property damage of not less than ONE MILLION DOLLARS (\$1,000,000) each occurrence and ONE MILLION DOLLARS (\$1,000,000) aggregate with respect to each of Contractor's owned, hired and/or non-owned vehicles assigned to or used in performance of the services. The policy shall contain a severability of interests provision.
- d. Each Bid shall include a Bid Bond or other guarantee equal to 5% of the Total BASE BID as listed on the bottom of the Bid Form. The Bid Bond or other security of the three lowest responsive bidders shall be retained until the successful bidder executes the Contract and furnishes the required Contract security, but not longer than 45 days. The Bid Bond or other guarantee of other bidders shall be returned within seven days.
 - e. Each Bid shall include a list of objections or suggested changes in the language of the Draft Construction Contract. Bidders may use the form provided or put this information in their own format.
 - f. Each Bid shall be submitted in a sealed envelope, and clearly marked on the outside **Reed Park Improvements Project**.
 - g. Altering and Withdrawing Biddings. Any hand written alteration to a bid must be initialed by the signer of the bid, guaranteeing authenticity. Bids cannot be altered or amended after the submission deadline, but may be withdrawn entirely at any time prior to the execution of the final Contract.
 - h. Information detailing the qualifications of the firm or team are not required, but may be requested after the bid opening.

- i. **Bid Deadline.** All Bids must be received in the City of Fruita Engineering office or main administrative counter in the Fruita Civic Center no later than the time and date shown in **Section 2 - Form of Bid and General Description of Bid and Award Process.** Late or unsigned bids will not be accepted or considered.
- j. **Responsiveness.** At the Bid Opening, each bid will be evaluated for responsiveness according to the checklist below. The City reserves the right to waive minor discrepancies in form or content of the bids, but the minimum requirements for responsiveness must be met. Any missing item from the checklist below is cause for rejection of the entire bid.
 - i. Signed Bid Form
 - ii. Acknowledgement of any and all Addenda
 - iii. Total BASE BID amount
 - iv. Bid Bond
 - v. Insurance Certificates – Workman’s Comp, Liability

9.0 Conflict of Interest

No City public official and/or City employee shall have a direct financial interest in any firm submitting a Bid under this Request. Any indirect interest in an Offeror firm by a City public official and/or City employee by virtue of blood or marriage shall be disclosed within the Bid.

10.0 Only One Bid Accepted

More than one bid proposal from an individual, firm, partnership, or corporation under the same or different names will not be considered. Evidence that any primary Offeror has an interest in more than one Bid for the same Work will be cause for rejection of all such bids. Evidence of collusion or other illegal activities between firms will be considered sufficient cause for the rejection of all Bids so affected. A subcontracted person or entity (such as a Surveyor or Traffic Control Firm) which has quoted prices to one bidder is not disqualified from quoting prices to other bidders but may not submit a direct bid on its own behalf.

The City of Fruita reserves the right to reject any or all Bids, and to waive any informalities or irregularities therein.

11.0 Description of Bid Items

Bid Item Descriptions are included in the Special Provisions. All Bid Items shall be priced as complete, in place.

END OF BID INSTRUCTIONS

City of Fruita

Department of Public Works
Engineering Division

Reed Park Improvements Project
CIP Project #130-795-77-4730

4. Special Provisions & Specifications


SPECIAL PROVISIONS AND ITEM DESCRIPTIONS

The Special Provisions listed hereafter are specific to this contract only and do not apply to any other contract. Any provisions stated herein shall take precedence over any other sections of this document. Any conflicting segment shall be void while the special provision is applicable. The Contractor is to review these special provisions and include any costs of these provisions in the applicable pay items of the bid.

1. Project Specifications

The CDOT Standard Specification for Road and Bridge Construction, 2011 Edition, The City of Fruita Design Criteria and Construction Specifications (DCCS) – 2009 Edition, the City of Fruita Standard Detail Drawings, and the included additional project specifications will govern general construction specifications. Copies of CDOT standard specifications are not included in the bid and specification package due to their length, but are incorporated herein by reference. Copies of CDOT standard specifications can be obtained from CDOT at: <http://www.dot.state.co.us/Publications/publications.htm> or by mail CDOT Headquarters, Bid Plans Room, 4201 E. Arkansas Ave., Denver, Colo. 80222. City of Fruita DCCS – 2009 can be downloaded from Fruita.org.

Administrative and contractual issues will be governed by various documents including these Special Provisions, the Bidding Instructions, the Construction Contract, and Section 100 of the CDOT Standard Specification for Road and Bridge Construction, 2011 Edition. In the case of discrepancies between similar administrative or contractual provisions contained in the various documents, the following hierarchy is specified:

- | | |
|--------------------------------------|------------------|
| 1. Construction Drawings | Highest Priority |
| 2. Additional Project Specifications | |
| 3. Fruita Special Provisions | |
| 4. Construction Contract | |
| 5. Fruita DCCS 2009 Manual | |
| 6. CDOT Standard Specifications | Lowest Priority |
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In the case of any discrepancies between the Project Drawings and the CDOT Standard Specification, the Project Drawings shall control. Any general changes from the standard CDOT construction specifications will be delineated in these Special Provisions, on the Project Drawings, or in Bid Addenda. When specifications or special provisions contain both English units and SI units, the English units apply and are the specification requirement.

2. Scope of Work

This project consists of the removal and modification of existing concrete, asphalt and park facilities and the installation of new recreation & pedestrian improvements, utilities and pavement, a skate/wheel park and shelter/restroom facilities. Work includes, but is not limited to, installation and maintenance of traffic control and storm drain inlet protection, removal of existing asphalt, concrete, underground utilities, an existing restroom structure and existing landscaping and trees; procurement and installation of concrete drain pan, curb, gutter and sidewalk, concrete pavement, asphalt pavement, sewer, water, irrigation and drainage utilities, a stormwater pump system, rest

room and shelter foundations and structures, playground facilities, wheel/skate park concrete and features, including related excavation, and trees/landscaping as shown on construction plans. Specific Work Item Descriptions are shown on the Bid Schedule and listed in **Section 15. Item Descriptions** of these Special Provisions.

3. Pre-Bid Conference

A Mandatory Pre-Bid Meeting will be held on Friday October 6th at 1:30 PM at the Fruita Civic Center located at 325 E. Aspen Avenue in Fruita, Colorado. Following the pre-bid meeting a site walk-through with city staff will occur. This walk-through is not considered mandatory.

4. Tentative Project Schedule

The following schedule provides the general timeline and/or milestones for which the project is anticipated to proceed. The dates presented below are subject to change at the direction of the City.

Event / Deadline	Date & Time
Advertisement Dates – GJ Sentinel, Bidnet, WCCA	Sundays, September 17 th , 24 th , October 1 st , 8 th . Electronically beginning Monday September 18 th , 2023
Plans and Bid Documents Available	Monday, September 18 th
Pre-Bid Meeting (MANDATORY)	Friday, October 6 th @ 1:30 PM
Project Questions Deadline	Wednesday, October 11 th @ 12:00 Noon
Final Addenda Issued	Thursday, October 12 th , E.O.D.
Bid Opening	Friday, October 13 th @ 1:30 PM
Notice of Award	Friday, October 20 th
Notice To Proceed	Following Signed Contract
Substantial Completion (Except Wheel Park)	June 1 st , 2024
Project Completed (Final Acceptance) (Except Wheel Park)	June 15 th , 2024

5. Hours of Operation

Contractor may perform work Monday through Friday during daylight hours, but may not start or operate equipment and machinery before 7:00 AM. Special approvals for weekend or night-time work, if needed, will be considered on a case-by-case basis. All work on this project, barring any delays associated with the wheel park, shall be completed by **June 15th, 2024**.

6. Road Closures, Detours, and Traffic Control

Traffic Control is a Lump Sum bid item. Traffic Control shall be placed in accordance with an approved Traffic Control Plan (TCP). The TCP must be submitted for approval to the City of Fruita Public Works Department with the *City Excavation and Right Of Way Permit*.

The contractor shall insure that access to individual parcels / residences (within and adjacent to the construction zone) be maintained at all times, minor delays excepted. The City and the contractor share the responsibility to keep the residents informed of work tasks affecting their property. Contractor shall provide notification of construction schedule to all residents affected at least three days in advance. Door hangers are acceptable.

7. Construction Sequencing

No construction sequencing recommendations are implied by these bid documents. Actual scheduling and performance of the Work is the sole responsibility of the Contractor, while minimizing traffic disruptions from detours and road closures.

8. Staging/Lay down Areas

Existing City of Fruita rights of way and easements are available to the Contractor for laydown, staging, equipment parking or other uses during the project provided traffic control is utilized to delineate the area. The field north of the area to be improved will NOT be available for equipment or material staging, as it is used heavily by the public throughout the year and hosts numerous city and private events. No existing driveway locations may be blocked at any time for staging/laydown purposes. Contractor must take precautions to ensure no materials are stored, dumped, leaked or otherwise placed or located such that they could enter private property, or existing storm drain inlets.

It is the responsibility of the Contractor to acquire and maintain property owner's permission for any additional staging areas required outside of the right-of-way. Staging areas outside of the project limits shall be kept clean and restored to a condition acceptable to the property owner prior to final acceptance.

9. Protection of Adjacent Improvements, Environmental Controls, and Site Restoration

The progress of the work shall be done in a manner to protect existing public facilities, such as utilities and concrete, as well as private property, specifically fences and landscaping not designated for removal. Any damage to existing facilities, public or private, and not designated for removal, shall be the sole responsibility of the Contractor to return to a pre-construction condition or better. All disturbances outside the Right of Way or easement shall be repaired to pre-construction conditions or better at the expense of the contractor.

The Contractor shall perform all the work in such a manner that the least environmental damage will result. Any questionable areas or items shall be brought to the attention of the City Project Manager for approval prior to removal or any damaging activity. Damaged or destroyed trees, shrubs, or grass, not designated on the plans, which could have been saved, shall be replaced and/or re-vegetated at the expense of the Contractor.

The Contractor shall implement and install standard Best Management Practices (BMP's) in constructing sediment control measures such as silt fence and storm inlet protection, storing chemicals and fuels, and servicing heavy equipment. Fuels, chemicals, and any other liquid or

solid hazardous substances shall be properly stored and handled per OSHA and/or EPA requirements to avoid spills and/or other discharges.

Of particular concern is protection of existing storm inlets (curb inlets) during construction. It is imperative that existing piping remain clean and free of soil and debris, such that the existing capacity of the outlet is not compromised. Protection of curb inlets via straw bales and/or gravel filters is mandatory and will be inspected by the City regularly. Any flushing or cleaning required for maintaining clean storm drainage piping during construction will not be paid as additional work.

A Construction Stormwater Discharge Permit, Dewatering Permit, or any other permits that may be required from the Colorado Department of Public Health and Environment Water Quality Control Division are the responsibility of the Contractor.

10. Construction Staking

The Engineer of Record shall be responsible for identifying or providing project benchmarks for horizontal and vertical control. In general, benchmarks as shown on the drawings.

The Contractor shall be responsible for all construction staking, layout and final placement of materials per the construction drawings. Any established survey monuments damaged, destroyed, or altered during construction that are not shown as being reset on the construction drawings shall be reset by a Colorado Licensed Professional Land Surveyor at the sole expense of the Contractor.

11. Utilities

The Contractor shall comply with Article 1.5 of Title 9, CRS (“Excavation Requirements”) when excavation or grading is planned in the area of underground utility facilities. The Contractor shall notify all affected utilities at least two (2) business days prior to commencing such operations. Contact the Utility Notification Center of Colorado (UNCC) at 811 or (800) 922-1987 to have locations of UNCC registered lines marked by member companies. All other underground facilities shall be located by contacting the respective company. Utility service laterals shall also be located prior to beginning excavating or grading.

The locations of utility facilities shown on the plan and profile sheets were obtained from the best available information. The contractor is responsible for all utility locates, and is responsible for any damage, replacement and repairs to affected utility lines. All costs incidental to the foregoing requirements will not be paid for separately but shall be included in the work.

Known utilities within the limits of this project are:

Water:	Ute Water	Sam Briscoe, 970-270-3075
Drainage:	City of Fruita	Public Works, 970-858-8377
Natural Gas:	Xcel Energy	Mike Easter, 970-260-6018
Electric:	Xcel Energy	Mike Easter, 970-260-6018
Sanitary Sewer:	City of Fruita	Public Works, 970-858-9558

Telephone:	Century Link/Lumen	Chris Johnson, 970-244-4311
Cable TV:	Optimum Communication	Jeff Valdez, 970-263-2314
Drainage:	City of Fruita	Public Works, 970-858-9558

The work described in these plans and specifications require coordination between the Contractor and the utility companies in accordance with the Contract. All utility relocations, both “Wet” (water, irrigation, sewer, and storm drains) and “Dry” (gas, phone, cable, power) are shown in the plans and bid documents as the responsibility of the Contractor. The Contractor shall keep the utility company(s) and the City of Fruita Project Manager advised of any work being done to their facility(s), so that the utility company(s) can coordinate their inspections for final acceptance of the work.

12. Measurement & Payment

The Bid Schedule is comprised of Lump Sum and Unit Price items of work that collectively covers all the work for this project. The Bid Schedule shows estimated quantities based on the Engineer’s Estimate. Actual quantities may be more or less than the Bid Schedule quantity. All quantities will be paid at the listed Unit Price. If there is a need to change the amount of work for a Unit Price Item, the schedule of Unit Prices will be the contractual basis for establishing the associated cost impact. Lump sum prices will only be changed via negotiated Change Order.

Each month the Contractor and the Owner will evaluate the progress of the work and agree to the overall percent complete for each Lump Sum item. This will be the basis for progress payments against lump sum items.

Measurement for payment quantities and associated surveying, calculations and documentation are the responsibility of the Contractor. Calculations and documentation shall be submitted to the City Project Manager, either before or concurrent with invoicing the items for which payment is requested. The City will also perform measurements and surveys on its own accord to verify payment quantities.

As a condition of final payment, the Contractor shall secure full written lien releases from all subcontractors, equipment and material suppliers, who have provided services, equipment and materials, on behalf of the contract, releasing the City and the Contractor from any further claim.

13. Conformity with Plans and Specifications, Price Reductions.

All work performed and all materials furnished shall conform to the lines, grades, cross sections, dimensions, and material requirements, including tolerances, specified in the Contract or as shown on the drawings. For those items of work where working tolerances are not specified, the Contractor shall perform the work in a manner consistent with reasonable and customary manufacturing and construction practices.

When the City Project Manager finds that the materials furnished, the work performed, or the finished product does not conform with the Plans, Specifications, or Contract but that reasonably acceptable work has been produced, the City Project Manager reserves the right to negotiate price reductions for sub-standard work that will remain in place. The City Project Manager may use Section 105 of the CDOT Standard Specification, incorporated by reference in **Section 1.**

Project Specifications, to evaluate appropriate price reductions, or other methods, at his discretion. If acceptable price reductions are negotiated, the City Project Manager will document the basis for acceptance by Contract Modification Order which will provide for an appropriate reduction in the Contract price for such work or materials. If a satisfactory price reduction cannot be negotiated, the City Project Manager reserves the right to require removal and replacement of substandard work at the expense of the Contractor.

When the City Project Manager finds the materials furnished, work performed, or the finished product are not in conformity with the Contract and has resulted in an inferior or unsatisfactory product, the work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor.

If deemed necessary by the City, materials will be sampled and tested by the City in accordance with the sampling and testing schedules and procedures contained in CDOT's Field Materials Manual. Materials or work will be evaluated for price reduction when deviations from specifications occur on any of the several individual tests for the lot. The Contractor will not have the option of accepting a price reduction in lieu of producing specification material. Continued production of non-specification material will not be permitted. Material which is obviously defective may be isolated and rejected without regard to sampling sequence or location within a lot.

14. Time of Completion

The City believes adequate time is contained in the schedule to achieve the Substantial Completion date for all improvements (other than those associated with the wheel park portion of the project) as shown in **Section 4** during normal working hours. **Due to the potential of limited qualified wheel park subcontractor availability, it is possible that wheel park construction may take longer than the time allotted by these provisions. If this is the case, substantial and final completion dates for the wheel park portion of the project ONLY will be renegotiated by the General Contractor and the City of Fruita. Tentative Project Schedule** Substantial Completion is defined as follows:

- 14.1. Date of Signature of the City Project Manager on the Notice of Substantial Completion.
- 14.2. All major construction, including utility, structure, asphalt and concrete pavement, and recreation facilities is completed per plan.
- 14.3. All road closures/ detours/ and traffic control removed, and all roads open to unrestricted travel in both directions.

Substantial Completion does not include minor repairs and punch list items that do not affect safe, unrestricted pedestrian and vehicle access through the corridor.

Any claim for delay resulting in potential changes to dates specified herein must be submitted in writing to the City Project Manager, who will evaluate the claim and issue a written response, and issue a change order if necessary. Claims for delay will not be considered valid solely based on the Contractor or Subcontractor(s) inability to complete a specific work task at a specific location, if similar work can be performed at a different location.

All construction projects encounter minor delays in certain tasks, and the City expects the Contractor to be flexible in addressing normal construction variability. By way of example, if a

utility installation at a particular location cannot be completed due to interference, but other work can be performed at a different location, a claim for delay will not be considered a valid claim. Similarly, if a utility installation encounters soft soils requiring additional excavation and backfill, this will be considered normal construction variability not subject to a claim for delay. In either of these examples a cost impact, and potential increase in Contract value may be valid, even though the claim for delay is not.

15. Item Descriptions

The following descriptions delineate the work, materials, and how measurements of completed work will be made and paid for regarding each bid item listed in the Bid Schedule. The Bidder is to read these definitions and price their proposal accordingly. The City of Fruita may choose to add, reduce, or eliminate any bid item or combination of bid items so the construction contract shall not exceed the encumbered funds allocated for this project.

Item 1 Mobilization & Demobilization

This pay item includes the Contractor's cost of moving all materials, equipment, and labor onto the job site, setup, providing a temporary sanitary facility, tear down and removing all debris, materials, equipment, and labor off the job site, dust abatement during the project, and final cleanup. The price for this item shall include all costs incorporated in performing the work described herein. Payment will be made at 50% of the Lump Sum amount upon initial mobilization, up to 90% during the work, and the final 10% after demobilization and advertisement.

Item 2 Construction Surveying

This pay item shall include all equipment, materials, and labor necessary for construction staking, layout, material verification, and production of project as-built drawings at the completion of the project per the City specifications. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 3 Material Testing

This pay item includes providing all Materials Testing according to the City of Fruita Design Criteria and Construction Specifications Manual. This includes all excavation and trench backfill within the public Rights-of-Way, camera testing, locating wire testing, concrete, asphalt and aggregate base course testing. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 4 Temp. Erosion and Sedimentation Control/Stormwater Management

This pay item includes furnishing all equipment, materials, and labor necessary to administer the CDPHE SWMP responsibilities for the Project as specified in Section 9 of these Special Provisions and in the included additional project specifications. Stormwater permits, BMP installation and upkeep and SWMP administration will be the Contractor's responsibility until SWMP inactivation. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 5 Traffic Control

This pay item includes furnishing a Traffic Control Plan, flaggers, daily traffic control inspections, and all equipment for traffic control throughout construction of the project. This includes installing any temporary pavement markings that may be necessary. In general, the City anticipates allowing the Contractor to fully close the southern Reed park parking lot for the duration of the

project (local traffic excepted). All traffic control shall be installed and maintained in accordance with the MUTCD. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 6 Site Clearing

This pay item includes all equipment, materials, and labor necessary to perform site clearing as specified in Section 311000 of the project specifications and as shown on the construction drawings. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 7 Earth Moving

This pay item includes all equipment, materials, and labor necessary to perform Earth moving as specified in Section 312000 of the project specifications and as shown on the construction drawings. This includes all Earth moving necessary to achieve final grades for all portions of the project, including the wheel park. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 8 Remove/Dispose of Existing Asphalt (Full-Depth)

This pay item includes all equipment, materials, and labor necessary to remove and dispose of all of the existing asphalt mat as shown on the construction drawings, including any saw-cutting of asphalt that may be necessary to remove asphalt. Any items removed that are not specifically identified on the construction drawings for removal shall not be measured and paid for separately unless approved by the City prior to removal. Payment for this item will be based on unit prices quoted for the actual asphalt quantity removed and disposed of.

Item 9 Remove/Dispose of Existing Concrete (Includes Wall)

This pay item includes all equipment, materials, and labor necessary to remove and dispose of existing concrete items, including curb, gutter, sidewalk, flatwork and playground walls as shown on the construction drawings. Any items removed that are not specifically identified on the construction drawings for removal shall not be measured and paid for separately unless approved by the City prior to removal. Payment for this item will be based on unit prices quoted for the actual concrete quantity removed and disposed of.

Item 9A Remove/Dispose of Existing Concrete (Includes Wall) (Add Alternate)

This pay item includes all equipment, materials, and labor necessary to remove and dispose of existing concrete items, including curb, gutter, sidewalk, flatwork and playground walls as shown on the construction drawings. This add alternate bid item includes any concrete removal shown in the "add alternate" area of the project specified on the construction drawings. This item has been included as an "add alternate" in order to evaluate the cost of this item separately from the main part of the project. However, this cost shall be included in the base bid amount. Any items removed that are not specifically identified on the construction drawings for removal shall not be measured and paid for separately unless approved by the City prior to removal. Payment for this item will be based on unit prices quoted for the actual concrete quantity removed and disposed of.

Item 10 Remove/Dispose of Existing Planting Area

This pay item includes all equipment, materials, and labor necessary to remove and dispose of existing vegetation such as turf, shrubbery, flowers, and other vegetation smaller than 3"-diameter trees, as shown on the construction drawings. Any items removed that are not specifically identified on the construction drawings for removal shall not be measured and paid

for separately unless approved by the City prior to removal. Payment for this item will be based on unit prices quoted for the actual planting area quantity removed and disposed of.

Item 10A Remove/Dispose of Existing Planting Area (Add Alternate)

This pay item includes all equipment, materials, and labor necessary to remove and dispose of existing vegetation such as turf, shrubbery, flowers, and other vegetation smaller than 3"-diameter trees, as shown on the construction drawings. This add alternate bid item includes any planting area removal shown in the "add alternate" area of the project specified on the construction drawings. This item has been included as an "add alternate" in order to evaluate the cost of this item separately from the main part of the project. However, this cost shall be included in the base bid amount. Any items removed that are not specifically identified on the construction drawings for removal shall not be measured and paid for separately unless approved by the City prior to removal. Payment for this item will be based on unit prices quoted for the actual planting area quantity removed and disposed of.

Item 11 Remove/Dispose of Existing Tree

This pay item includes all equipment, materials, and labor necessary to remove and dispose of existing vegetation larger than 3"-diameter trees, as shown on the construction drawings. Any items removed that are not specifically identified on the construction drawings for removal shall not be measured and paid for separately unless approved by the City prior to removal. Payment for this item will be based on unit prices quoted for the actual planting area quantity removed and disposed of.

Item 11A Remove/Dispose of Existing Tree (Add Alternate)

This pay item includes all equipment, materials, and labor necessary to remove and dispose of existing vegetation larger than 3"-diameter trees, as shown on the construction drawings. This add alternate bid item includes any tree removal shown in the "add alternate" area of the project specified on the construction drawings. This item has been included as an "add alternate" in order to evaluate the cost of this item separately from the main part of the project. However, this cost shall be included in the base bid amount. Any items removed that are not specifically identified on the construction drawings for removal shall not be measured and paid for separately unless approved by the City prior to removal. Payment for this item will be based on unit prices quoted for the actual tree quantity removed and disposed of.

Item 12 Remove/Dispose of Existing Bathroom Facility/Foundation

This pay item includes all equipment, materials, and labor necessary to remove and dispose of an existing block bathroom structure, including its foundation and any plumbing, HVAC, electrical or mechanical appurtenances associated with the structure. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 13 Remove/Dispose of Existing Playground Equipment

This pay item includes all equipment, materials, and labor necessary to remove and dispose of existing playground equipment, including any footers or other structural elements associated with the equipment. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 14 Remove/Salvage Existing Merry-Go-Round Structure

This pay item includes all equipment, materials, and labor necessary to remove, salvage and deliver (or store) an existing merry-go-round play feature in the existing playground area of the park. Particular care shall be given to the removal, salvage, storage or delivery of this item due

to its historical importance to the community. Damage occurring during any work on this item shall be the responsibility of the Contractor to remediate to the satisfaction of the City, including possible monetary compensation for damage or loss of the structure. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 15 Remove/Dispose of Existing Playground Mulch

This pay item includes all equipment, materials, and labor necessary to remove and dispose of existing playground mulch. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 16 Cap/Remove/Abandon Existing Gas Service

This pay item includes all equipment, materials, and labor necessary to remove, cap and abandon the existing gas service line that feeds the existing bathroom facility, as shown on the construction plans, or to schedule and pay for the work to be performed by others if required by Xcel. All specifications and guidelines for removal of an existing gas service line required by Xcel Energy shall be followed by the Contractor. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 17 Cap/Remove/Abandon Existing Water Tap/Service/Meter

This pay item includes all equipment, materials, and labor necessary to remove, cap and abandon the existing domestic water line that feeds the existing bathroom facility, as shown on the construction drawings. All specifications and guidelines for removal of an existing meter and water service line required by Ute Water Conservancy shall be followed by the Contractor. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 18 Cap/Remove/Abandon Existing Sewer Service Line

This pay item includes all equipment, materials, and labor necessary to remove, cap and abandon the existing sanitary sewer service line that serves the existing bathroom facility, as shown on the construction drawings. The Contractor shall excavate the sewer tap at the main line in Elm St., install a permanent cap and backfill and repair the pavement in that location per City of Fruita specifications. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 19 Remove/Dispose of Existing Horseshoe Pits

This pay item includes all equipment, materials, and labor necessary to remove and dispose of the existing horseshoe pits as shown on the construction drawings. Removal of all appurtenances associated with the horseshoe pits, including posts, backing structures, sand, crusher fine base material, and other material or equipment is included in this item. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 20 Remove/Dispose of Existing Drain Sump

This pay item includes all equipment, materials, and labor necessary to remove and dispose of the existing drain sump structure located near the existing bathroom and to fill the resulting void with pit run or other suitable fill material. The structure consists of a gravel-filled pipe with a metal lid on the surface and is approximate 8'-deep. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 21 Remove/Dispose of Existing Drinking Fountain

This pay item includes all equipment, materials, and labor necessary to remove and dispose of an existing drinking fountain as shown on the construction drawings. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 22 Remove/Dispose of Existing Chain Link Fence

This pay item includes all equipment, materials, and labor necessary to remove and dispose of existing chain link fence, including all posts and footers, as shown on the construction drawings. Payment for this item will be based on unit prices quoted for the actual fence quantity removed and disposed of.

Item 23 Catalpa Speciosa (Western Catalpa Tree)

This pay item includes all equipment, materials, and labor necessary to procure, install and brace/protect new 2"-diameter Western Catalpa trees as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual tree quantity installed.

Item 23A Catalpa Speciosa (Western Catalpa Tree) (Add Alternate)

This pay item includes all equipment, materials, and labor necessary to procure, install and brace/protect new 2"-diameter Western Catalpa trees as shown on the construction drawings and as listed in the included additional project specifications. This add alternate bid item includes any tree installation shown in the "add alternate" area of the project specified on the construction drawings. This item has been included as an "add alternate" in order to evaluate the cost of this item separately from the main part of the project. However, this cost shall be included in the base bid amount. Payment for this item will be based on unit prices quoted for the actual tree quantity installed.

Item 24 Morus Alba 'Fruitless' (Fruitless Mulberry Tree)

This pay item includes all equipment, materials, and labor necessary to procure, install and brace/protect new 2"-diameter Fruitless Mulberry trees as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual tree quantity installed.

Item 25 Comus Sericea (Red Twig Dogwood Shrub)

This pay item includes all equipment, materials, and labor necessary to procure, install and brace/protect new Red Twig Dogwood Shrubs as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual shrub quantity installed.

Item 26 Boeteloua Gracilis (Blue Grama Grass)

This pay item includes all equipment, materials, and labor necessary to procure, install and protect new Blue Grama grasses as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual grass quantity installed.

Item 26A Boeteloua Gracilis (Blue Grama Grass) (Add Alternate)

This pay item includes all equipment, materials, and labor necessary to procure, install and protect new Blue Grama grasses as shown on the construction drawings and as listed in the included additional project specifications. This add alternate bid item includes any grass installation shown in the "add alternate" area of the project specified on the construction drawings. This item has been included as an "add alternate" in order to evaluate the cost of this

item separately from the main part of the project. However, this cost shall be included in the base bid amount. Payment for this item will be based on unit prices quoted for the actual grass quantity installed.

Item 27 Nepeta (Little Trudy) (Catmint ‘Little Trudy’)

This pay item includes all equipment, materials, and labor necessary to procure, install and protect new Little Trudy Catmint plants as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual grass quantity installed.

Item 28 Perovskia Atriplicifolia (Russian Sage)

This pay item includes all equipment, materials, and labor necessary to procure, install and protect new Russia Sage plants as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual grass quantity installed.

Item 28A Perovskia Atriplicifolia (Russian Sage) (Add Alternate)

This pay item includes all equipment, materials, and labor necessary to procure, install and protect new Russia Sage plants as shown on the construction drawings and as listed in the included additional project specifications. This add alternate bid item includes any plant installation shown in the “add alternate” area of the project specified on the construction drawings. This item has been included as an “add alternate” in order to evaluate the cost of this item separately from the main part of the project. However, this cost shall be included in the base bid amount. Payment for this item will be based on unit prices quoted for the actual grass quantity installed.

Item 29 Buffalo Brand Dura-Turf Plus

This pay item includes all equipment, materials, and labor necessary to procure, install and protect new Buffalo Brand Dura-Turf Plus seed mix as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual grass seed quantity installed.

Item 30 Temporary Tree and Plant Protection

This pay item includes all equipment, materials, and labor necessary to protect existing trees and plants while construction activities are underway, as shown on the construction drawings and as listed in the included additional project specifications. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 30A Temporary Tree and Plant Protection (Add Alternate)

This pay item includes all equipment, materials, and labor necessary to protect existing trees and plants while construction activities are underway, as shown on the construction drawings and as listed in the included additional project specifications. This add alternate bid item includes any plant installation shown in the “add alternate” area of the project specified on the construction drawings. This item has been included as an “add alternate” in order to evaluate the cost of this item separately from the main part of the project. However, this cost shall be included in the base bid amount. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 31 Boulder Type A

This pay item includes all equipment, materials, and labor necessary to procure and install Type-A boulders as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual boulder quantity installed.

Item 32 Boulder Type B

This pay item includes all equipment, materials, and labor necessary to procure and install Type-B boulders as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual boulder quantity installed.

Item 33 Horseshoe Pit (Complete in Place)

This pay item includes all equipment, materials, and labor necessary to install horseshoe pits as shown on the construction drawings and as listed in the included additional project specifications. Crushed stone pavement surrounding each pit is not included in this pay item. Payment for this item will be based on unit prices quoted for the actual horseshoe pit quantity installed.

Item 34 Pedestrian Cast-in-Place Concrete Paving (Complete in Place) (COGJ GV-B Mix 4500 psi) (Gray)

This pay item includes all equipment, materials, and labor necessary to install 4"-thick Gray City of Grand Junction Class GV-B 4500 psi concrete on a 6"-thick layer of compacted class 6 aggregate road base material, as shown on the construction drawings and as listed in the included additional project specifications. Road base and excavation required to achieve the grades and elevations shown on the construction drawings shall be considered incidental to this pay item. Payment for this item will be based on unit prices quoted for the actual quantity of concrete installed.

Item 34A Pedestrian Cast-in-Place Concrete Paving (Complete in Place) (COGJ GV-B Mix 4500 psi) (Gray) (Add Alternate)

This pay item includes all equipment, materials, and labor necessary to install 4"-thick Gray City of Grand Junction Class GV-B 4500 psi concrete on a 6"-thick layer of compacted class 6 aggregate road base material, as shown on the construction drawings and as listed in the included additional project specifications. This add alternate bid item includes any Pedestrian Cast-in-Place Concrete Paving shown in the "add alternate" area of the project specified on the construction drawings. This item has been included as an "add alternate" in order to evaluate the cost of this item separately from the main part of the project. However, this cost shall be included in the base bid amount. Road base and excavation required to achieve the grades and elevations shown on the construction drawings shall be considered incidental to this pay item. Payment for this item will be based on unit prices quoted for the actual quantity of concrete installed.

Item 35 Vehicular Cast-in-Place Concrete Paving (Complete in Place) (COGJ GV-B Mix 4500 psi) (Gray)

This pay item includes all equipment, materials, and labor necessary to install 6"-thick Gray City of Grand Junction Class GV-B 4500 psi concrete on a 6"-thick layer of compacted class 6 aggregate road base material, as shown on the construction drawings and as listed in the included additional project specifications. Road base and excavation required to achieve the grades and elevations shown on the construction drawings shall be considered incidental to this

pay item. Payment for this item will be based on unit prices quoted for the actual quantity of concrete installed.

Item 35A Vehicular Cast-in-Place Concrete Paving (Complete in Place) (COGJ GV-B Mix 4500 psi) (Gray) (Add Alternate)

This pay item includes all equipment, materials, and labor necessary to install 6"-thick Gray City of Grand Junction Class GV-B 4500 psi concrete on a 6"-thick layer of compacted class 6 aggregate road base material, as shown on the construction drawings and as listed in the included additional project specifications. This add alternate bid item includes any Vehicular Cast-in-Place Concrete Paving shown in the "add alternate" area of the project specified on the construction drawings. This item has been included as an "add alternate" in order to evaluate the cost of this item separately from the main part of the project. However, this cost shall be included in the base bid amount. Road base and excavation required to achieve the grades and elevations shown on the construction drawings shall be considered incidental to this pay item. Payment for this item will be based on unit prices quoted for the actual quantity of concrete installed.

Item 36 Vehicular Ramp (Complete in Place) (COGJ GV-B Mix 4500 psi)

This pay item includes all equipment, materials, and labor necessary to install a vehicular ramp as shown on the construction drawings and as listed in CDOT standard specification M-608-1. Required cl. 6 aggregate base course under the new concrete is considered incidental to this pay item. Payment for this item will be based on unit prices quoted for the actual quantity of ramps installed.

Item 37 Pedestrian Ramp (Complete in Place) (COGJ GV-B Mix 4500 psi)

This pay item includes all equipment, materials, and labor necessary to install a pedestrian ramp as shown on the construction drawings and as listed in CDOT standard specification M-608-1. Required cl. 6 aggregate base course under the new concrete is considered incidental to this pay item. Payment for this item will be based on unit prices quoted for the actual quantity of ramps installed.

Item 38 8"-Thick Concrete Drain Pan (Complete in Place) (CDOT Class D Mix)

This pay item includes furnishing all equipment, materials, and labor necessary to install 8"-thick CDOT Class D concrete drainage pan as shown on the construction drawings. Required cl. 6 aggregate base course under the new concrete is considered incidental to this pay item. All concrete shall be cured with a spray-applied curing compound according to applicable City specification and shall be doweled into adjacent existing concrete. Payment for this item will be based on unit prices quoted for the actual quantity of concrete installed.

Item 39 Concrete Curb & Gutter (Complete in Place) (COGJ GV-B Mix 4500 psi)

This pay item includes furnishing all equipment, materials, and labor necessary to install City of Grand Junction Class B 4500 psi concrete curb and gutter as shown on the construction drawings. Required cl. 6 aggregate base course under the new concrete is considered incidental to this pay item. All concrete shall be cured with a spray-applied curing compound according to applicable City specification and shall be doweled into adjacent existing concrete. Payment for this item will be based on unit prices quoted for the actual area of concrete installed.

Item 40 Sidewalk Chase (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to install sidewalk chase drains as shown on the construction drawings. Payment for this item will be based on unit prices quoted for the actual number of chases installed.

Item 41 Park Electrical System (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to provide an electrical system as shown on the construction drawings, including the connection to the existing power supply, conduit, wire, direct-bury cable, electrical boxes, connections to light poles/lights, stormwater pump connection, MUSCO Mini-Pitch electrical system connection, and transformers. This pay item only applies to the system outside of the two shelter structures. Any electrical work performed inside those structures should be included in the cost of the structures. Payment of this Lump Sum item shall be made in increments upon completion of design and construction.

Item 42 Light Type 1 (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to install Type 1 light poles and fixtures as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual number of lights installed.

Item 43 Bench Type 1

This pay item includes furnishing all equipment, materials, and labor necessary to install Type 1 benches as shown on the construction drawings. Payment for this item will be based on unit prices quoted for the actual number of benches installed.

Item 43A Bench Type 1 (Add Alternate)

This pay item includes furnishing all equipment, materials, and labor necessary to install Type 1 benches as shown on the construction drawings. This add alternate bid item includes any benches shown in the "add alternate" area of the project specified on the construction drawings. This item has been included as an "add alternate" in order to evaluate the cost of this item separately from the main part of the project. However, this cost shall be included in the base bid amount. Payment for this item will be based on unit prices quoted for the actual number of benches installed.

Item 44 Picnic Table Type 1

This pay item includes furnishing all equipment, materials, and labor necessary to install Type 1 picnic tables as shown on the construction drawings. Payment for this item will be based on unit prices quoted for the actual number of picnic tables installed.

Item 45 Bike Rack (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to install a bike rack as shown on the construction drawings. Payment for this item will be based on unit prices quoted for the actual number of bike racks installed.

Item 46 Trash Bin

This pay item includes furnishing all equipment, materials, and labor necessary to install black-colored 36-gallon trash bins in the expanded metal design as shown on the construction drawings. Payment for this item will be based on unit prices quoted for the actual number of trash bins installed.

Item 47 Decorative Metal Fence (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to install decorative metal fence as shown on the construction drawings and as listed in the included additional project specifications, including all related appurtenances such as posts and post caps. Payment for this item will be based on unit prices quoted for the actual quantity of decorative metal fence installed.

Item 48 Asphalt Pavement (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to install an asphalt mat as shown on the construction drawings and as listed in the included additional project specifications. Required cl. 6 aggregate base course and geotextile fabric under the new asphalt is considered incidental to this pay item. Payment for this item will be based on unit prices quoted for the actual area of 3"-thick asphalt installed.

Item 49 Crushed Stone Surfacing (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to install crushed stone surfacing as shown on the construction drawings and as listed in the included additional project specifications. Required geotextile fabric, metal edging and base underlayment are considered incidental to this pay item. Payment for this item will be based on unit prices quoted for the actual amount of crushed stone surfacing installed.

Item 50 Painted Pavement Markings

This pay item includes furnishing all equipment, materials, and labor necessary to install painted pavement markings as shown on the construction drawings and as listed in the included additional project specifications. In general, this pay item refers to parking lot and street striping. Payment for this item will be based on unit prices quoted for the actual quantity of markings installed.

Item 51 Thermoplastic Pavement Markings

This pay item includes furnishing all equipment, materials, and labor necessary to install thermoplastic pavement markings as shown on the construction drawings and as listed in the included additional project specifications. In general, this pay item refers to accessible parking pavement markings. Payment for this item will be based on unit prices quoted for the actual number of markings installed.

Item 52 Irrigation – Design/Build

This pay item includes furnishing all design services, equipment, materials, and labor necessary to design and install an irrigation system sufficient to serve the improvements as shown on the construction drawings and as listed in the included additional project specifications. The design of the system shall be approved by City Parks Department personnel prior to construction. A drawing showing the approximate locations and specifications of the existing Reed Park irrigation system is being provided with this bid package. Payment of this Lump Sum item shall be made in increments upon completion of design and construction.

Item 52A Irrigation – Design/Build (Add Alternate)

This pay item includes furnishing all design services, equipment, materials, and labor necessary to design and install an irrigation system sufficient to serve the improvements as shown on the construction drawings and as listed in the included additional project specifications. The design of the system shall be approved by City Parks Department personnel prior to construction. A drawing showing the approximate locations and specifications of the existing Reed Park irrigation system is being provided with this bid package. This add alternate bid item includes any design and installation for landscape improvements as shown in the "add alternate" area of the project

specified on the construction drawings. This item has been included as an “add alternate” in order to evaluate the cost of this item separately from the main part of the project. However, this cost shall be included in the base bid amount. Payment of this Lump Sum item shall be made in increments upon completion of design and construction.

Item 53 4” Perforated HDPE Underdrain Pipe (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to install new 4” perforated underdrain pipe, including excavation, excavation bracing, excavation de-watering, pipe bedding, backfill and compaction as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual lineal footage of pipe installed.

Item 54 6” Perforated PVC Underdrain Pipe (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to install new 6” perforated underdrain pipe, including excavation, excavation bracing, excavation de-watering, pipe bedding, backfill and compaction as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual lineal footage of pipe installed.

Item 55 6” PVC Storm Drain Pipe (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to install new 6” storm drain pipe, including excavation, excavation bracing, excavation de-watering, pipe bedding, backfill and compaction as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual lineal footage of pipe installed.

Item 56 4” SDR-35 PVC Sanitary Sewer Service Pipe (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to install new 4” sanitary sewer service pipe, including excavation, excavation bracing, excavation de-watering, pipe bedding, backfill and compaction as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual lineal footage of pipe installed.

Item 57 4” Sanitary Sewer Cleanouts

This pay item includes furnishing all equipment, materials, and labor necessary to install new 4” sanitary sewer cleanouts, including excavation, excavation bracing, excavation de-watering, structure bedding, backfill and compaction as shown on the construction drawings. Payment for this item will be based on unit prices quoted for the actual number of cleanouts installed.

Item 58 4” Storm Drain Cleanouts

This pay item includes furnishing all equipment, materials, and labor necessary to install new 4” storm drain cleanouts, including excavation, excavation bracing, excavation de-watering, structure bedding, backfill and compaction as shown on the construction drawings. Payment for this item will be based on unit prices quoted for the actual number of cleanouts installed.

Item 59 6” Storm Drain Cleanouts

This pay item includes furnishing all equipment, materials, and labor necessary to install new 6” storm drain cleanouts, including excavation, excavation bracing, excavation de-watering,

structure bedding, backfill and compaction as shown on the construction drawings. Payment for this item will be based on unit prices quoted for the actual number of cleanouts installed.

Item 60 Storm Drain Inlets

This pay item includes furnishing all equipment, materials, and labor necessary to install new storm drain inlets, including excavation, excavation bracing, excavation de-watering, structure bedding, backfill and compaction as shown on the construction drawings and as listed in the included additional project specifications. Payment for this item will be based on unit prices quoted for the actual number of inlets installed.

Item 61 1-1/2" Copper Domestic Water Service

This pay item includes furnishing all equipment, materials, and labor necessary to install new 1-1/2" copper domestic water service pipe, including excavation, excavation bracing, excavation de-watering, structure bedding, backfill and compaction as shown on the construction drawings. Any applications or fees required by Ute Water Conservancy to connect to domestic water main lines should not be included in the cost of this item and will be paid for and performed by the City of Fruita outside of this contract. The new water meter, as well as any hot-tapping required to connect this new service line to active distribution lines owned and operated by Ute Water Conservancy should not be included in the cost of this item and will be paid for and performed by the City of Fruita or Ute Water Conservancy outside of this contract. Construction and materials shall comply with current City of Fruita and Ute Water Conservancy specifications, in addition to any plumbing codes currently in effect in the City of Fruita. Payment for this item will be based on unit prices quoted for the actual lineal footage of pipe installed.

Item 62 Stormwater Pump System (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to install the new stormwater pump system, including excavation, excavation bracing, excavation de-watering, structure bedding, backfill and compaction as shown on the construction drawings, as well as any electrical improvements needed to provide a fully functional pump system as shown on the construction plans. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 63 Shelter/Restroom (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to construct a turn-key new shelter/restroom facility, including all mechanical, electrical, structural, foundation and plumbing improvements as shown on the construction drawings and as listed in the included additional project specifications. All permitting and costs associated with required permitting shall be the responsibility of the Contractor. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 64 Northern Shelter (Complete in Place) (Install Only)

This pay item includes furnishing all equipment, materials, and labor necessary to construct a City-supplied shelter structure, including all electrical and foundation improvements as shown on the construction drawings and as listed in the included additional project specifications. All permitting and costs associated with required permitting shall be the responsibility of the Contractor. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 65 Skate/Wheel Park (Complete in Place)

This pay item includes furnishing all equipment, materials, and labor necessary to construct a skate/wheel park, including but not limited to concrete, concrete reinforcing, metals, painting, clearing and earthwork as shown on the construction drawings and as listed in the included additional project specifications. Payment of this Lump Sum item shall be made in increments upon completion of construction.

Item 66 Contingency/Force Account

This pay item is intended for Contract Changes not included in the other pay items above. Payment of this Lump Sum item shall be made in increments for each item encountered at a mutually agreed sum between the Contractor and Fruita Project Engineer or Project Manager.

SUMMARY

This concludes the pay items listed in the proposal. Please be aware that the only payments made under this contract are for the pay items listed in the proposal and no other payments or additional payments will be made to the contractor for work specified and shown in these documents. If any discrepancies exist, the contractor should notify the project manager in writing, requesting clarification as soon as practical.

The following items have not been included as specific pay items and are considered incidental to the construction for which they are required, unless otherwise identified in a bid item:

- Dust control
- Erosion and Environmental control
- Watering / Dewatering
- Temporary facilities and utilities
- Barricades and other required safety provisions
- Cold weather protection
- Construction Contract Administration including completion and submittal of required forms and other paperwork

END OF SPECIAL PROVISIONS

City of Fruita

Department of Public Works
Engineering Division

Reed Park Improvements Project
CIP Project #130-795-77-4730

5. Additional Park Specifications

TABLE OF CONTENTS

DIVISION 00 – PROCUREMENT AND CONTRACTING DOCUMENTS

Not Used – To be provided by owner

GENERAL PROVISIONS OF THE CONTRACT:

General Conditions

Provided by owner

Supplementary Conditions

Agreement between Owner and Contractor

Provided by owner

Section	Title	Issue Date
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DIVISION 01 - GENERAL REQUIREMENTS
(Other Division 01 sections to be provided by Owner)

015639	Temporary Tree and Plant Protection	August 4, 2023
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Section	Title	Issue Date
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TECHNICAL SPECIFICATIONS

DIVISION 2 – EXISTING CONDITIONS

221110	Trenching <i>by Collins Engineering</i>	August 4, 2023
221313	Facility Sanitary Services <i>by Collins Engineering</i>	August 4, 2023

DIVISION 3 - CONCRETE

Not Used at This Time

DIVISION 4 - MASONRY

044300.13	Landscape Boulders	August 4, 2023
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DIVISIONS 5 THROUGH 10

DIVISION 11 - EQUIPMENT

0116800.13	Specialty Play Features	August 4, 2023
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DIVISIONS 12 THROUGH 25

Not Used at this Time

DIVISION 26 - ELECTRICAL

265600	Exterior Lighting	August 4, 2023
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DIVISIONS 27 thru 30

Not Used at this Time

DIVISION 31 - EARTHWORK

311000	Site Clearing <i>by Collins Engineering</i>	August 4, 2023
312000	Earth Moving <i>by Collins Engineering</i>	August 4, 2023
312270	Temporary Erosion and Sedimentation Control <i>by Collins Engineering</i>	August 4, 2023

DIVISION 32 – EXTERIOR IMPROVEMENTS

321216	Asphalt Paving <i>by Collins Engineering</i>	August 4, 2023
321313	Concrete Paving <i>by Collins Engineering</i>	August 4, 2023
321350	Exterior Cast-in-Place Concrete <i>by Collins Engineering</i>	August 4, 2023
321363	Pavement Marking <i>by Collins Engineering</i>	August 4, 2023
321540	Crushed Stone Paving	August 4, 2023
321816	Playground Protective Surfacing	August 4, 2023
323119	Decorative Metal Fences and Gates	August 4, 2023
3323300	Site Furnishings	August 4, 2023
328433	Irrigation System – Design/Build	August 4, 2023
329113	Soil Preparation	August 4, 2023

Section	Title	Issue Date
329200	Turf and Grasses	August 4, 2023
329300	Plants	August 4, 2023

DIVISION 33 – UTILITIES

331113	Water Distribution Piping <i>by Collins Engineering</i>	August 4, 2023
331373	Concrete Pavement Joint Sealants <i>by Collins Engineering</i>	August 4, 2023
333113	Sanitary Sewer <i>by Collins Engineering</i>	August 4, 2023
334000	Storm Drainage <i>by Collins Engineering</i>	August 4, 2023
334100	Storm Utility Drainage Piping <i>by Collins Engineering</i>	August 4, 2023
334600	Subdrainage <i>by Collins Engineering</i>	August 4, 2023

SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work of this Section Includes: General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Requirements:
 - 1. Section 311000 "Site Clearing" for removing existing trees and shrubs.

1.2 DEFINITIONS

- A. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape at a height 54 inches above the ground line.
- B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
 - a. Tree-service firm's personnel, and equipment needed to make progress and avoid delays.
 - b. Arborist's responsibilities.
 - c. Quality-control program.
 - d. Coordination of Work and equipment movement with the locations of protection zones.
 - e. Trenching by hand or with air spade within protection zones.
 - f. Field quality control.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1.5 INFORMATIONAL SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by ISA or Certified Arborist-Municipal Specialist as certified by ISA
- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.7 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Moving or parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Backfill Soil: Stockpiled soil mixed with planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.
 - 1. Mixture: Well-blended mix of two parts stockpiled soil to one part planting soil.
 - 2. Planting Soil: Planting soil as specified in Section 329113 "Soil Preparation"
- B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
 - 1. Type: Shredded hardwood.
 - 2. Size Range: 3 inches maximum, 1/2 inch minimum.
 - 3. Color: Natural.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements: Previously used materials may be used when approved by Landscape Architect.
 - 1. Chain-Link Protection-Zone Fencing: Polymer-coated steel fencing.
 - a. Height: 6 feet
 - b. Polymer-Coating Color: Black.
 - 2. Gates: Single swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag each tree trunk at 54 inches above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
 - 1. Apply 4-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.
 - 2. Install temporary root protection matting over mulch to the extent indicated.

3.3 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.
- B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

3.4 REGRADING

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

3.5 FIELD QUALITY CONTROL

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

3.6 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Landscape Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.
- B. Trees: Remove and replace trees indicated to remain that are in an unhealthy condition before the end of the corrections period or are damaged during construction operations that a certified arborist determines are incapable of restoring to normal growth pattern.
 - 1. Provide one new tree of 6-inch caliper size for each tree being replaced that measures more than 6 inches in caliper size.
 - a. Species: Species selected by Landscape Architect.
 - 2. Plant and maintain new trees as specified in Section 329300 "Plants."
- C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 2-inch uniform thickness to remain.
- D. Soil Aeration: Where directed by Landscape Architect, aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch-diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

END OF SECTION 015639

SECTION 044400.13 - LANDSCAPE BOULDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Landscape Boulders.

- B. Related Sections:

- 1. Section 312000 "Earth Moving" for excavation and subgrade preparation and materials.
 - 2. Section 329300 "Plants" for planting.

1.4 ACTION SUBMITTALS

- A. Samples: For each type of landscape boulder, provide at least two full-size Samples to show the full range of color and other visual characteristics expected in completed Work.

- 1. High-resolution digital photos, a minimum of 3 taken from various angles, may be submitted in lieu of physical samples. Landscape Architect reserves the right to review the material at supplier's yard, quarry or other source of extraction or supply.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved (minimum of 3 projects comparable to scope of work indicated herein and on Drawings) for installation of landscape boulders required for this Project.

- B. Source Limitations for Boulders: Obtain each variety of landscape boulder, excluding those salvaged during site demolition, from one quarry with resources to provide materials of consistent quality in appearance and physical properties. Re-use any existing boulders on-site that are indicated to be removed, with approval from Landscape Architect.

- C. Mockups: Build Mockups to demonstrate aesthetic effects.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Landscape Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may be part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle landscape boulders to prevent deterioration or damage due to contaminants, breaking, chipping, scarring or other causes.
- B. Use fabric straps to move and place boulders. Do not use chains or metal implements to move boulders.

1.8 PROJECT CONDITIONS

- A. Do not install landscape boulders that are damaged, scarred or broken. Landscape Architect to verify boulders prior to installation.
- B. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace landscape boulder work damaged by frost or freezing.
- C. Weather Limitations for Mortar and Grout:
 1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.
 - a. When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set landscape boulders within 1 minute of spreading setting-bed mortar.

PART 2 - PRODUCTS

2.1 BOULDERS

- A. Landscape Boulders: Sound, durable natural stone boulders.
 1. Brown sandstone moss rock, with irregular, angular/round shape, (to match Landscape Architect's sample), sizes shall be as indicated on Drawings as sourced/field collected from to be determined.

2. Final selection and location of landscape boulders shall be determined in the field under the direction of the Landscape Architect. Drawings indicate the approximate quantity, size and locations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for excavation tolerances, condition of subgrades, and other conditions affecting performance of landscape boulders.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 LANDSCAPE BOULDER INSTALLATION

- A. Dry-Laid: Install landscape boulders in locations as indicated on Drawings and as directed by Landscape Architect in the field. Landscape boulders shall be buried to a depth equal to 1/3 of the boulder's height.
- B. Utilize setting methods to protect boulders from damage, scarring, or breaking during installation.
- C. Remove any visible markings and clean boulders of dirt, stains and debris prior to final acceptance by Landscape Architect.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace landscape boulders that are damaged, scarred or broken during or after installation.
- B. Remove any visible markings and clean landscape boulders of dirt, stains, and debris prior to final acceptance by Landscape Architect.

3.4 EXCESS MATERIALS AND WASTE

- A. Excess Landscape Boulders: Place excess landscape boulders were directed by Owner for Owner's use.
- B. Excess Accessory Material Waste: Remove excess accessory material waste and legally dispose of off Owner's property.

END OF SECTION 044400.13

SECTION 116800 – SPECIALTY PLAY FEATURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes play equipment as follows:
 - 1. Horseshoe Pit

1.3 DEFINITIONS

- A. Definitions in ASTM F1487 apply to Work of this Section.
- B. IPEMA: International Play Equipment Manufacturers Association.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of playground equipment.
 - 1. Include plans, elevations, sections, and attachment details.
- C. Samples for Verification: For each type of exposed finish on the following products:
 - 1. Include Samples of accessories to verify color and finish selection.
 - 2. Posts: Minimum 6 inches long.
 - 3. Wood: Minimum (2) 24 inches long.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer manufacturer and testing agency.
- B. Product Certificates: For each type of playground equipment.

- C. Material Certificates: For the following items:
 - 1. Wood-Preservative Treatment: Include certification by treating plant that states type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
- D. Field quality-control reports.
- E. Sample Warranty: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground equipment and finishes to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain playground equipment from single source from single manufacturer.

2.2 SPECIALTY PLAY FEATURES

- A. Horseshoe pit:
 - 1. Metal stake:
 - a. Material: Galvanized-steel tent stake
 - b. Size: As Indicated

2. Wood Backstop:
 - a. Posts: Pressure treated wood posts not less than 4 inches square or larger.
 - b. Backboard: Pressure treated wood boards not less than 2 inches by 6 inches.
3. Play/Foul Lines
 - a. Material: Pressure treated wood boards not less than 2 inches by 8 inches.
4. Sand: Masonry sand.

2.3 FABRICATION

- A. Provide sizes, strengths, thicknesses, wall thickness, and weights of components as required to comply with requirements in ASTM F1487. Factory drill components for field assembly. Unnecessary holes in components, not required for field assembly, are not permitted. Provide complete horseshoe pit components, including supporting members and connections, and other components indicated or required for equipment indicated.
- B. Wood Frame: Fabricate main-frame upright support posts from wood. Fabricate secondary frame members, bracing, and connections from wood, steel, or aluminum.

2.4 MATERIALS

- A. Steel: Material types, alloys, and forms recommended by manufacturer for type of use and finish indicated, hot-dip galvanized.
- B. Wood: Douglas fir, preservative treated after fabrication or Pine, preservative treated after fabrication, surfaced smooth on all sides and all edges rounded.
- C. Hardware: Manufacturer's standard; commercial-quality; corrosion-resistant; hot-dip galvanized steel and iron, stainless steel, or aluminum; of a vandal-resistant design.
- D. Fasteners: Manufacturer's standard; corrosion-resistant; hot-dip galvanized or zinc-plated steel and iron, or stainless steel; permanently capped; and theft resistant.

2.5 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment: Pressure-treat wood products according to AWPAC U1 and the following:
 1. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.

2.6 CAST-IN-PLACE CONCRETE

- A. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch-maximum-size aggregate.
- B. Concrete Materials and Properties: Dry-packaged concrete mix complying with ASTM C387/C387M and mixed at site with potable water, according to manufacturer's written instructions, for normal-weight concrete with minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch-maximum-size aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work.
 - 1. Do not begin installation before final grading required for placing playground equipment and protective surfacing is completed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions for each equipment type unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.
- B. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.
- C. Post Set with Concrete Footing: Comply with Section 033000 "Cast-in-Place Concrete" for measuring, batching, mixing, transporting, forming, and placing concrete.
 - 1. Set posts in concrete footing. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.
 - a. Place concrete around posts and vibrate or tamp for consolidation. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
 - 2. Embedded Items: Follow equipment manufacturer's written instructions and drawings to ensure correct installation of anchorages for equipment.
 - 3. Finishing Footings: Smooth top, and shape to shed water.

END OF SECTION 116800.13

SECTION 221110 - TRENCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Subsurface drainage backfill for walls and trenches.
2. Excavating and backfilling for utility trenches.
3. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
4. Excavating and backfilling trenches within building lines.

B. Related Sections include the following:

1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
2. Section 312000 "Earth Moving" for soil materials, site excavating, filling and grading.
3. Section 312270 "Temporary Erosion and Sedimentation Control" for erosion and sediment control.
4. Section 221313 "Facility Sanitary Sewer" for sanitary sewer main installation.

C. Related Documents

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
2. Additional information concerning trenching and backfilling may be found on the civil drawings, in the project geotechnical study/report and City of Fruita Design Criteria and Construction Specifications Manual, latest edition. In case of conflict between the drawings, jurisdictional criteria and the information specified herein, the more stringent requirements shall govern.
3. Additional information concerning earthwork may be found in the geotechnical investigation report. All requirements of this report shall be followed unless noted otherwise. The information shown in this report is for information and it shall be the contractors responsibility to field verify conditions indicated.

D. Shoring Design: Provide the services of a professional engineer to design all shoring, bracing, and underpinning required to protect the safety of workers and integrity of adjacent existing structures or other improvements.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as backfill approved by Geotechnical Engineer.
- E. Unclassified Excavation: Removal of all material of whatever-character required for the work encountered above subgrade elevations and to lines and dimensions indicated, including boulders.
- F. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed or approved by Owner's Representative and the testing and inspections agency to correct unsatisfactory conditions. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- G. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
- H. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Owners Representative. Unauthorized excavation including disposition of overexcavated materials and other work resulting from slides, cave-ins, swelling, upheaval, or remedial work, as well as remedial work directed by Owners Representative, shall be without additional compensation.
- I. Rock Excavation: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
 1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,090 lbf and stick-crowd force of not less than 18,650 lbf; measured according to SAE J-1179.
 2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 48,510-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.
- J. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- L. Utilities: Includes on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of plastic warning tape.
- B. Samples: Contractor to submit representative samples of all materials proposed for use in bedding and trench backfilling operations to the testing and inspections agency for analysis and determination of compliance with the requirements specified herein.
- C. Material Test Reports: Provided by Owner from a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.
- D. Pre-Excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.4 QUALITY ASSURANCE

- A. Testing Agency:
 - 1. All testing and inspections required herein will be performed by an independent testing and inspection agency employed by the Owner.
 - 2. Notify the testing and inspection agency not less than 48 hours in advance of all work requiring testing or inspection services.
- B. Regulatory Requirements: Comply with all applicable requirements of the Occupational Safety and Health Administration and local and State rules, regulations, and ordinances concerning shoring, bracing, or sloping of excavations and safety of workers. Safety of workers is the responsibility of the Contractor.
- C. Coordination: Coordinate scheduling and procedures for trench excavation, bedding, and backfilling with other Sections whose work relates to or is affected by this work.
- D. Pre-Construction Conference: Conduct conference at Project site as directed by Owner's Representative prior to start of construction. Contractor to comply with requirements, which also may be included in Division 1 Section "Project Management and Coordination."

1.5 PROJECT CONDITIONS

- A. Existing Utilities: Locations, sizes and depths or invert elevations of existing utilities as shown on the drawings are based on information provided by others, and are believed to be correct, but may not be absolutely so. Such information is therefore presumed only as approximations and should be verified prior to construction. Do not interrupt utilities serving facilities occupied by

Owner or others unless permitted in writing by Owner's Representative and then only after arranging to provide temporary utility services according to requirements indicated.

1. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's Representative's written permission.
 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.
- C. Existing Bench Marks: Carefully preserve and maintain existing bench marks, monuments, property line pins, and other reference points. If disturbed or destroyed, restore or replace them at no additional cost to the Owner.
- D. Verification of Existing Conditions: Visit the site prior to submission of bids. Verify existing conditions, elevations, and utility locations. In the event of discrepancies between existing conditions and those indicated on the Contract Documents or survey, contact the Owner's Representative for clarification.

1.7 WARRANTY

Settlement in backfill, fill or in structures built over backfill or fill, which may occur within the specified project warranty period, shall be corrected at no cost to the Owner. Any structures damaged by settlement shall be restored to their original condition by the Contractor, at no cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Utility Trench Bedding Materials:

1. Granular Bedding: Well graded mixture of sound mineral aggregate complying with Class 67 (Modified) gradation in accordance with the following table:

Class 67 (Modified) Gradation	
<u>Nominal Size</u>	<u>Percent Passing by Weight</u>
¾"	90-100
3/8"	20-55
No. 4	5-10
No. 8	5-10

In the event the excavation or overexcavation for bedding is below the water table, the sub-bedding material shall consist of ¾" to 1-1/2" rock (or larger if approved), placed in accordance with the Agency have authority .

2. Sand Bedding: Clean, well-graded sand, not more than 5% by weight passing a No. 200 sieve.

3. Agency Requirements: Bedding requirements shall be in accordance with jurisdiction having control over utility.

B. Utility Trench Backfill Materials:

1. Existing soils obtained from trench excavations, including granular or aggregate base course from removed pavements, broken and pulverized claystone or claystone-sandstone bedrock may be used for backfilling trenches, provided it meets any special requirements of the Utility Agency and Geotechnical Engineer. Bedrock must be processed and broken or pulverized so that the maximum particle or fragment size does not exceed three-inches (3").

C. Unsuitable Utility Trench Materials:

Materials unsuitable for bedding and backfilling include highly organic soils, ASTM D2487 Group PT topsoil, and soils containing roots, vegetable matter, trash, and debris.

2.2 ACCESSORIES

- A. Shoring and Bracing: Provide all materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross-braces, in good and serviceable condition, as required for safety and by governing authorities.
- B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
 1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which the work of this Section will be performed. Do not proceed with the work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Section "Site Clearing."

- C. Protect and maintain erosion and sedimentation controls, which are specified in Section "Temporary Erosion and Sediment Control," during earthwork operations.
- D. Existing Utilities:
 - 1. General: Location of existing utilities shown on the plans are approximate only. The Contractor shall be responsible to locate all existing underground utilities in areas of the work. If utilities are to remain in place, provide protection during excavation and back-filling operations. Should uncharted or incorrectly charted piping or other utilities be encountered during excavations, consult the Owner's Representative immediately for direction. Cooperate with the Utility Agency in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the Utility Agency.
 - 2. Active Utilities: Do not interrupt existing utilities serving facilities occupied and used by the Owner or by adjacent properties, except when permitted in writing by the Owner's Representative, and then only after acceptable temporary utility services have been provided. Remove or relocate utilities only as indicated or specified.
 - 3. Inactive Utilities: Report inactive or abandoned utilities encountered in excavating or grading operations, and remove, plug, or cap as required. In the absence of specific requirements, plug or cap such utility lines at least 5'-0" outside new building walls, or as required by local requirements.
 - 4. Removal: Demolish and completely remove from the project site all existing underground utilities indicated to be removed. Coordinate with Utility Agencies for discontinuance of services if lines are active.
- E. Protection of Persons and Property:
 - 1. Provide all necessary measures to protect workmen and passersby. Barricade open excavations occurring as part of the work, as required by municipal or other authorities having jurisdiction.
 - 2. Protect adjacent streets, structures, and other improvements from damage caused by settlement, undermining, washout, and other hazards created by trench excavations.
- F. Protect subgrades and trench bottoms soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- G. Cold Weather Work: Prevent frost from entering bearing strata upon which construction will taken place or in areas where fill will be placed in that season.

3.3 DEWATERING

- A. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations and to collection or runoff areas. Establish and maintain temporary drainage ditches and diversions away from trench excavations. Do not use trench excavations as temporary drainage ditches.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
3. Obtain and comply with all provisions of the Colorado Department of Public Health and Environment, Water Quality Control Division, Construction Dewatering Permit.

3.4 SHORING AND BRACING

- A. Provide shoring and bracing of excavations as required for safety and by governing authorities. Carry down shoring and bracing as excavation progresses. Maintain shoring and bracing in excavations regardless of time period excavations will be open.

3.5 PAVEMENT REMOVAL AND REPLACEMENT

- A. Where trenches or other utility excavations are made in existing paved areas, saw-cut pavement surface to create a clean break line. Cut pavement a minimum of 12" beyond trench width on each side of trench; remove and dispose of existing surface course and aggregate base course, leaving a 12" wide undisturbed subgrade lip on each side of trench.
- B. After trench has been backfilled and compacted, place new pavement in accordance with applicable requirements of Division 32 Sections as applicable, for Asphaltic or Portland cement concrete pavement and in accordance with Authorities having jurisdiction.

3.6 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated on the drawings.
- C. Clearance: 12 inches each side of pipe or conduit.
 1. Slope sides of trenches or provide shoulders in accordance with OSHA requirements and as required by Utility Agency standards.
 2. Continuously monitor cut slopes and trenches for distress or movement. Provide all necessary shoring and bracing required to protect the life and safety of workmen performing excavation or installing piping or conduit.
- D. Trench Bottoms: Excavate trenches a minimum of 3 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course and backfill with a 6" layer of crushed stone or gravel prior to installing pipe.

3.8 BEDDING OF PIPES:

- A. After completion of trench excavation and before installation of piping, install not less than 3" of approved bedding material in trench bottom for support of pipe. Dig bell holes in bedding deep enough to provide a minimum of 2" clearance between the bell and bedding material. Fully support pipe on bedding material for the full length of the pipe barrel.
- B. After pipe is adjusted for line and grade, and all jointing is complete, carefully place and tamp bedding material under the haunches of the pipe and in the previously dug bell holes.
- C. Install bedding to a minimum depth of 12" above top of pipe prior to starting placement of compacted backfill. Lightly compact or tamp bedding material in a manner to avoid displacement of or damage to the pipe.

3.9 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials in approved locations without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 UTILITY TRENCH BACKFILL

- A. After installation of utility piping or lines have been completed, locations recorded, trash or other debris removed from excavations, and bedding placed and approved, backfill promptly as work and weather conditions permit. Do not backfill trenches until all required pipe system tests and inspections have been made, unless partial backfilling is required to restrain pipe under test pressures. Use care in backfilling to avoid damage or displacement of pipe systems.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.
- C. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- D. Place backfill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand operated tampers. Use hand held tools or compacting devices for trench backfill, until a minimum compacted thickness of 3'-0" above top of pipe is achieved. Mechanical or power compactors may be used thereafter.
- E. Before compaction, moisten or aerate each layer of backfill to specifications.

- F. Compact each layer to not less than 95% of maximum standard Proctor density (ASTM D698). Thoroughly compact by means of mechanical tampers areas which cannot be properly compacted by means of rolling equipment.
- G. Backfill to subgrade elevation shown for finish grading, topsoil placement, or paving.
- H. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- I. Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- J. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- K. Install warning tape directly above utilities, 12 inches below finished grade, and 6 inches below subgrade under pavements and slabs.

3.11 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Section "Subdrainage Systems."
- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - 1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - 1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
 - 2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

- C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Perform field moisture tests in accordance with ASTM D3017. Tests will be performed at the following locations and frequencies at a minimum:
 - 1. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests. At a minimum, test intervals and quantities shall meet or exceed the requirements of the local utility agency.
- D. When testing agency reports that backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.13 PROTECTION

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

3.14 CLEANING AND ADJUSTMENT:

- A. Reconditioning Compacted Areas: When completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and recompact to required density prior to further construction.
- B. Cleanup: Remove excess materials not required for backfilling purposes, including excess spoil material, accumulated debris, and rubbish from site. Burning of waste material is prohibited.

3.15 RESTORATION:

- A. Adjacent Improvements: Restore all fences, irrigation ditches, yards, lawns, and other structures or surfaces to condition equal to or better than before work began.

3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

END OF SECTION 221110

SECTION 221313 – FACILITY SANITARY SERVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Excavation, trenching, removal of existing manholes and piping, backfill, compaction, bedding, soil stabilization, groundwater removal, connection to existing manholes, and installation of pipe, manholes, aggregate base course and gravel where required, service wyes, service lines, asphalt removal and replacement, and all necessary appurtenances and safety precautions. Also includes removal and replacement of existing paving, concrete, topsoil and landscaping where required.
- B. Additional information concerning the sanitary sewer distribution systems may be found on the Civil Drawings. In case of conflict between the drawings and the information specified herein, the more stringent requirements shall govern.
- C. Related Sections:
 - 1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 2. Section 312000 "Earth Moving" for soil materials, site excavating, filling, and grading.
 - 3. Section 312270 "Temporary Erosion and Sedimentation Control" for erosion and sediment mitigation.
 - 4. Section 221110 "Trenching" for excavating and backfilling of utilities.
- D. Permits and Fees: Contractor to obtain and pay for all permits required for work in this Section. Pay all fees for inspections by local authorities and utility agency for work specified in this Section.

1.2 REFERENCE TO CITY OF FRUITA DESIGN CRITERIA AND CONSTRUCTION SPECIFICATIONS MANUAL

All work of this section shall be performed in conformance to the current City of Fruita Standards and Specifications as subsequently revised, which are incorporated into these specifications by reference. Supplementary requirements may be developed by the Engineer to address project-specific conditions, which may supersede the above-referenced specification.

END OF SECTION 221313

SECTION 265600 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Light Type 1

- B. Related Sections:

- 1. Section 31 2000 "Earth Moving" for excavation and subgrade preparation and materials.

1.3 PERFORMANCE REQUIREMENTS

- A. Live Load: Single load of 500 lbf.
- B. Ice Load: 3 lbf/sq. ft.
- C. Wind Load:
 - 1. Wind speed for poles 50 feet or less in height is 110 mph.

1.4 QUALITY ASSURANCE

- A. Quality Standard: AASHTO LTS-4, IEEE C2.

1.5 WARRANTY

- A. Materials and Workmanship for Luminaires: Five years.
 - 1. Metal Corrosion: Five years.
 - 2. Color Retention: Five years.
- B. Materials and Workmanship for Lamps: Lamps and fuses that fail within 12 months.

PART 2 – PRODUCTS

Coordinate all lighting with Architecture. Confirm styles and finishes when more information is known.

2.1 LIGHT TYPE 1 (Lighting Fixture)

1. Basis-of-Design Product: Beacon: RATIO Series, Area/Site Lighter; as manufactured by Current Lighting. Available through HLI Solutions, Inc. 701 Millennium Boulevard, Greenville, SC 29607 303-573-0222 x115, www.currentlighting.com/beacon, or approved equal.
2. Catalog #: RAR1-80L-25-3K7-3-UNV-A3-BLT
3. Series: RAR1 : Ratio Area Size 1
4. Number of LEDs-Wattage: 80L-25 – 25W - 3,000 Lumens
5. CCT/CRI: 3K7 – 3000K, 70 CRI
6. Distribution: 3 – IES Type III
7. Optics Rotation: No Rotation
8. Voltage: UNV – Universal 120-227V
9. Mounting: A3 – A (Arm Mount for Round Pole); 3 (At least one SCPREMOTE required to program SCP motion sensor)
10. Color: BLT – Black Matte Textured
11. Note: Contractor should confirm electrical option.

2.2 LIGHT TYPE 1 (Pole)

1. Basis-of-Design Product: RSA-B-S Series Poles. Pole as manufactured by Current Lighting. Available through HLI Solutions, Inc. 701 Millennium Boulevard, Greenville, SC 29607 303-573-0222 x115, www.currentlighting.com/beacon, or approved equal.
2. Catalog #: RSA-B-S-18-40-B-CAP-1-B3-BLT
3. Series: RSA-B-S
4. Height: 18 feet
5. Shaft: 40 – 4” Round
6. Thickness: B – 0.188
7. Mounting: CAP – Flat Cap; 1 – Single Arm Mount
8. Drill Pattern: 2 Bolt (2-1/2” spacing), Viper “A” arm
9. Finish: BLT – Black Matte Textured
10. Note: Contractor should confirm electrical option.

2.3 MOUNTINGS, FASTENERS, AND APPURTENANCES:

Corrosion-resistant items compatible with support components.

- A. Materials: Shall not cause galvanic action at contact points.
 1. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire according to manufacturer’s specifications.
 1. Fasten luminaire to indicated structural supports.

- B. Adjust luminaires that require field adjustment or aiming.

3.2 FIELD QUALITY CONTROL

- 1 Inspect each installed fixture for damage. Replace damaged fixtures and components.
- 2 Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
- 3 Verify operation of photoelectric controls.

END OF SECTION 265600

SECTION 311000 – SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Removing existing trees, shrubs, groundcovers, plants, grass, and other vegetation.
2. Clearing and grubbing.
3. Stripping and stockpiling topsoil.
4. Removing above- and below-grade site improvements.
5. Disconnecting, capping or sealing, and removing site utilities.
6. Removing existing fill.

B. Related Sections include the following:

1. Section 312000 "Earth Moving" for soil materials, excavating, backfilling, and site grading.
2. Section 312270 "Temporary Erosion and Sedimentation Control" for storm water erosion and sediment mitigation.

1.2 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.3 MATERIAL OWNERSHIP

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

1.4 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings, identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions. Information required may also be included in Division 1 Section "Project Record Documents."

1.5 QUALITY ASSURANCE

- A. Preconstruction Conference: Conduct conference at Project site as directed by Owner's Representative prior to start of construction. Contractor to comply with requirements, which may also be included in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing indicated removal and alteration work on property adjoining Owner's property will be obtained by Owner before award of Contract. Authority and permits for performing indicated removal and alteration work on adjacent rights-of-way shall be obtained by Contractor.
 - 1. Do not proceed with work on adjoining property until directed in writing by Owner's Representative.
- C. Protect improvements on adjacent and Owner's property.
- D. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- E. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- F. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.
- G. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section "Earth Moving," (PART 2 – PRODUCTS).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks, survey control points, monuments, property line pins and other reference points from disturbance during construction. If disturbed or destroyed, restore or replace at no cost to Owner.
- B. Provide erosion control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust from leaving project site.
- C. Locate and clearly flag trees and vegetation to remain or to be relocated.
- D. Protect existing site improvements to remain from damage during construction.
 - 1. Restore or replace damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

- A. Erect and maintain temporary fencing around drip line of individual trees or around perimeter drip line of groups of trees to remain before starting site clearing. Remove fence when construction is complete.
 - 1. Do not store construction materials, debris, or excavated material within fenced area.
 - 2. Do not permit vehicles, equipment, or foot traffic within fenced area.
 - 3. Maintain fenced area free of weeds and trash.
- B. Do not excavate within tree protection zones, unless otherwise indicated.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
 - 1. Cover exposed roots with burlap and water regularly.
 - 2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
 - 3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 - 4. Cover exposed roots with wet burlap to prevent roots from drying and backfill with soil as soon as possible.
- D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Owner's Representative.
 - 1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
 - 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.3 UTILITIES

- A. Contractor will locate, identify, arrange for disconnect and seal or cap off utilities indicated to be removed before site clearing.
 - 1. Verify that utilities indicated as abandoned have been disconnected and capped before proceeding with site clearing.
 - 2. Arrange with utility companies having jurisdiction to shut off indicated utilities.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's Representative's written permission.
- C. Excavate for and remove underground utilities indicated to be removed.
- D. Removal of underground utilities may also be included in Division 2 Sections covering site utilities. Removal of underground utilities may also be included in Division 15 Mechanical or Division 16 Electrical Sections.
- E. After removal of underground utilities, as indicated, properly cap and/or plug existing lines to remain in accordance with authorities having jurisdiction.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Grind stumps and completely remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
 - 4. Use only hand methods for grubbing within drip line of remaining trees.
 - 5. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earth moving is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.

- B. Strip topsoil to whatever depths are encountered or as determined by Geotechnical Engineer in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Limit height of topsoil stockpiles to 72 inches unless authorized by Owner's Representative.
 - 2. Do not stockpile topsoil within drip line of remaining trees.
 - 3. Dispose of excess topsoil as specified for waste material disposal.
 - 4. Stockpile surplus topsoil to allow for respreading a thicker layer of topsoil.

3.6 SITE IMPROVEMENTS

- A. Remove existing above and below grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated on plans.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.
- C. Remove existing fill. Refer to Geotechnical Investigation and/or drawings for information regarding suitability for re-use and estimates of location/extent of existing fill.

3.7 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
 - 1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 311000

SECTION 312000 – EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Preparing and grading subgrades for slabs-on-grade, walks, pavements, lawns and grasses, and exterior plants.
2. Excavating and backfilling for buildings and structures including over-excavation of existing unsatisfactory on-site soil materials and replacement with structural fill.
3. Drainage course for slabs-on-grade.
4. Subbase and base course for asphalt or concrete paving.
5. Subsurface drainage backfill for walls and trenches.

B. Related Sections include the following:

1. Section 311000 "Site Clearing" site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
2. Section 221110 "Trenching" for excavating and backfilling of utilities.
3. Section 312270 "Temporary Erosion and Sedimentation Control" for erosion and sedimentation control measures.

C. Permits and Fees: Obtain and pay for all permits and fees required for the work of this section, including erosion and sediment control and water quality permits required by the Colorado Department of Public Health and Environment, Water Quality Control Division.

D. Additional information concerning earth moving may be found on the civil drawings, in the project geotechnical report and City of Fruita Design Criteria and Construction Specifications Manual, latest edition. In case of conflict between the drawings, jurisdictional criteria and the information specified herein, the more stringent requirements shall govern.

E. Additional information concerning earth moving may be found in the geotechnical investigation report. All requirements of this report shall be followed. The information shown in this report is for information and it shall be the contractors responsibility to field verify conditions indicated.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill approved by Geotechnical Engineer.
- E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of all material of whatever character required for the work encountered above subgrade elevations and to lines and dimensions indicated, including boulders. See Section 3.4 for definition of unclassified and classified excavation.
- G. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed or approved by Owners Representative and the testing and inspections agency to correct unsatisfactory conditions. Authorized additional excavation and replacement material will be paid for according to Contract Provisions for changes in the Work.
- H. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
- I. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Owners Representative. Unauthorized excavation including disposition of overexcavated materials and other work resulting from slides, cave-ins, swelling, upheaval, or remedial work, as well as remedial work directed by Owners Representative, shall be without additional compensation.
- J. Fill: Fill is all material placed to raise the grade of the site or to backfill excavation, upon which the Geotechnical Engineer has made sufficient tests and observations to enable him to issue a written statement that, in his opinion; the fill has been placed and compacted in accordance with the requirements of these specifications.
- K. Structural Fill: Select granular material for use below floor slabs and to 5'-0" beyond building lines. On-site material may be used if approved by the Geotechnical Engineer.
- L. Underslab Gravel: Imported Class 6 road base per Colorado Department of Transportation Standard Specifications for Road and Bridge Construction (1999) or material approved by Geotechnical Engineer.
- M. Rock Excavation: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for Bulk Excavation or 3/4 cu. yd. for footing, trench, and pit excavation which in the Geotechnical Engineer's opinion cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
 - 1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,090 lbf and stick-crowd force of not less than 18,650 lbf measured according to SAE J-1179.
 - 2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 48,510-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.

- N. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- O. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- P. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- Q. Utilities: Include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 SUBMITTALS

- A. Material Test Reports: Provided by Owner from a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.
- B. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.4 QUALITY ASSURANCE

- A. Comply with applicable codes, ordinances, regulations, references and standards in effect at bid date:
 - 1. Uniform Building Code (UBC) or International Building Code (IBC) per jurisdiction criteria.
 - 2. American Society for Testing and Materials (test methods as specified hereafter)(ASTM).
 - 3. State and local codes.
- B. In case of conflict between the above codes, regulations, references and standards and these specifications, the more stringent requirements shall govern.
- C. Testing Agency: The Owner will employ a qualified independent Geotechnical testing agency. Contractor shall furnish testing agency access to work, facilities and incidental labor required for testing. Notify the testing and inspection agency not less than 48 hours in advance of all work requiring testing.
- D. Geotechnical Engineer: All materials and operations under this section of the specifications shall be executed under the supervision of a Geotechnical Engineer who will place qualified personnel on the site during earth moving operations as necessary.

The Geotechnical Engineer shall approve all foundation excavations and give written approval of the completed foundations to the Owner's Representative at the following times:

1. When excavations are first open.
 2. Just prior to placing of concrete, shall test and control the fill compaction, approve the materials and method of placing and compacting and give written approval to the Owner's Representative that all bearing surfaces and fill requirements have been inspected.
 3. The Contractor shall be responsible to notify the Geotechnical Engineer when tests are to be made.
- E. For approval of imported or on-site fill material, notify the Geotechnical Engineer at least four (4) working days in advance of intention to import material, designate the proposed borrow area and permit the Geotechnical Engineer to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material. The Geotechnical Engineer report on the acceptability shall be final and binding.
- F. Reference Standards:
- Compaction Standard: Standard Proctor Density ASTM D698.
- G. Preconstruction Conference: Conduct conference at Project site as directed by Owner's Representative prior to start of construction. Contractor to comply with requirements, which may also be included in Division 1 Section "Project Management and Coordination."
- H. Overlot grading contractor to provide as-built survey of grading ensure compliance with grading plan. Storm water management to be turned over to site contractor with signed off agreement on site grading.

1.5 PROJECT CONDITIONS

- A. Existing Utilities: Locations, sizes and depths or invert elevations of existing utilities as shown on the drawings are based on information provided by others, and believed to be correct, but may not be absolutely so. Such information is therefore presented only as approximations, and should be verified prior to construction. Protect from damage any sewer, water, gas, electric, phone or other pipe lines or conduits uncovered during the work until they have been examined by the Owner's Representative. If such lines are found to be abandoned and not in use, remove affected sections without extra cost. If such lines are found to be in use, carefully protect and carry on work around them. If Owner's Representative deems it advisable to move such lines, Owner will pay cost of moving. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Owner's Representative and then only after arranging to provide temporary utility services according to requirements indicated.
1. Contact utility-locator service for area where project is located before excavating.
 2. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
 3. Do not proceed with utility interruptions without Owner's Representative's written permission.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

- C. Remove all existing fill deemed by Geotechnical Engineer to be unsatisfactorily placed.
- D. Existing Contours and Elevations: Contours and spot elevations of existing ground elevations at the site, and approximate elevations of finish grade cuts, fills, and excavations for the Work are shown on Drawings. Contours and elevations for existing ground lines are based on information provided by others, and are believed to be correct, but may not be absolutely so. Existing contours and elevations should therefore be considered approximate, and should be verified at the site prior to construction.
- E. Verification of Existing Conditions: Visit the site prior to submission of bids. Verify existing conditions, elevations, and contours. In the event of discrepancies between existing conditions and those indicated on the Contract Documents or survey, contact the Owner's Representative for clarification.
- F. Existing Benchmarks: Carefully preserve and maintain existing benchmarks, monuments, property line pins, and other reference points. If disturbed or destroyed, restore or replace by a Professional Land Surveyor at no additional cost to Owner.
- G. Frost Protection: When freezing temperatures may be expected, do not excavate to the full depth indicated unless the footing or slabs are to be poured immediately after the excavation has been completed. If placing of concrete is delayed, protect the bottoms of excavations from frost until concrete is placed.

1.7 WARRANTY

Settlement in backfill, fill or in structures built over backfill or fill, which may occur within the specified project warranty period, shall be corrected at no cost to the Owner. Any structures damaged by settlement shall be restored to their original condition by the Contractor, at no cost to the Owner.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Shall meet approval of Geotechnical Engineer and shall be free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Clean, on-site, natural soils, or imported materials, as approved by the Geotechnical Engineer.
- C. Unsatisfactory Soils: Soil Classification Groups GP, SP, CH, MH, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups, as identified by the Geotechnical Engineer.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Backfill and Fill: Approved by Geotechnical Engineer.

- E. Structural Fill: Approved by Geotechnical Engineer.
- F. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1 ½-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1 ½-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1 ½-inch sieve and not more than 12 percent passing a No. 200 sieve.
- I. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- J. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1 ½-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- K. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- L. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.
- M. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

- A. Subsurface Drainage and Separation Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288. Utilize Mirafi 140N or as recommended by Geotechnical Engineer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Preparation of subgrade for earth moving operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."

- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Temporary Erosion and Sediment Control," during earth moving operations. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil bearing water runoff or airborne dust to adjacent properties and rights-of-way.
- D. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- E. Cold Weather Work: Prevent frost from entering bearing stratus upon which construction will take place or in areas where fill will be placed in that season.

3.2 DEWATERING

- A. Prevent surface water and subsurface ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
 - 3. Obtain and comply with all provisions of the Colorado Department of Public Health and Environment, Water Quality Control Division, Construction Dewatering Permit.
- C. Protection of Persons and Property:
 - 1. Provide all necessary measures to protect workmen and passersby. Barricade open excavations occurring as part of the Work, as required by municipal or other authorities having jurisdiction.
 - 2. Protect adjacent streets, roadways, and properties throughout the entire operation. Protect newly graded areas from destruction by weather or runoff. Protect structures, utilities, sidewalks, pavements, and other improvements from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: All excavation (other than rock excavation) is considered as unclassified and is defined as removal of all material encountered, regardless of soil type. Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include soil materials, and obstructions. Unclassified excavation is considered normal excavation and no extra costs will be allowed.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 2. Remove material of every nature or description encountered in obtaining required lines and grades. Excavate and/or place and compact fill to provide for building pad elevation(s) required by drawings.
 3. Excavate wide enough at foundations and retaining walls to permit erection and removal of forms, application of dampproofing or waterproofing.
 4. Pitch grading around excavations to prevent water from running into excavated areas.
 5. Pre-rip hardpan and soft bedrock with single-tooth ripper or other suitable equipment to facilitate excavation with conventional earth-moving equipment.
 6. Bearing soils disturbed by excavating equipment must be recompacted to 95 percent of maximum Standard Proctor Density (ASTM D698) prior to placing concrete.
 7. Exposed areas which will receive fill once properly cleaned, shall be scarified to a minimum depth of 8", conditioned to near optimum moisture content, and compacted.
- B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth excavation and rock excavation. Do not excavate rock until it has been classified and cross sectioned by Owner's Representative.
1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
- C. Stability:
1. Slope sides of excavations in compliance with OSHA requirements and local codes or ordinances. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
 2. Continuously monitor cut slopes for distress. Take all necessary precautions to safeguard workers, structures, and utilities.
 3. Provide all necessary shoring, sheeting, or bracing of sides of excavations required to prevent caving, erosion, and gulying. Provide underpinning of existing structures or other improvements adjacent to excavations which are subject to damage.
- D. Unanticipated Conditions: Notify the Owner's Representative immediately upon finding evidence of previous structures or filled materials which penetrate below designated excavation levels, groundwater or water-bearing strata, or other conditions which are not shown or which cannot be reasonably assumed from existing surveys and geotechnical reports. Secure the Owner's Representative instruction before proceeding with further work in such areas.
- E. Rock Excavation: Includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction. Rock excavation in unconfined areas is defined as removal and disposal of material which in the Geotechnical Engineer's opinion, cannot be excavated without continuous and systematic drilling and blasting, or continuous use of a suitable ripper or other special equipment.
1. Unanticipated Rock Excavation: Rock excavation that is not indicated on existing surveys or which cannot be reasonably assumed from geotechnical studies of the site and

which could not have been anticipated without extensive investigations. Unanticipated rock excavation shall be subject to change order procedures or previously agreed upon unit prices.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 0.10-foot. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Pile Foundations: Stop excavations 6 to 12 inches (150 to 300 mm) above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
 - 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.
 - 4. Excavation Below Slab on Grade or, walks, pavement: Overexcavate clays and claystone within the proposed footprint of the building slab-on-grade to a minimum depth of as recommended in Geotech Report and replace with on-site or imported materials as approved by Geotechnical Engineer.
- B. Existing man-made fill shall be removed under structures as required by the Geotechnical Engineer.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.
- B. Scarify subgrade soils beneath exterior slabs, sidewalks and pavements to a minimum depth of 8-inches, moisture condition and recompact as specified.
- C. Existing man-made fill shall be removed under walks and pavements as required by the Geotechnical Engineer.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Refer to Section "Trenching", for excavating and backfilling of utilities.

3.8 SUBGRADE INSPECTION

- A. Notify Geotechnical Engineer when excavations have reached required subgrade.
- B. If Owner's Representative and Geotechnical Consultant determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

- C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Remove and replace soft areas. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Owner's Representative, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner's Representative, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Geotechnical Engineer. If approved by Geotechnical Engineer, structural fill placed at 100 percent ASTM D698, 2 percent below to 1 percent above optimum moisture may be used.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Owner's Representative.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials in approved locations without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

8. Acceptance of subgrade by Geotechnical Engineer.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Refer to Section "Trenching", for excavating and backfilling of utilities.

3.13 SOIL FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

1. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
2. In areas of fill, scarify natural soil following removal of unsatisfactory material, to a depth of 8".

B. Place and compact fill material in layers to required elevations per the geotechnical report and as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill or structural fill as approved by Geotechnical Engineer.
4. Under building slabs, use engineered fill or reconditioned on-site soils or imported fills of native soils as approved by Geotechnical Engineer.
5. Under footings and foundations, use engineered fill or reconditioned on-site soils or imported fills of native soils as approved by Geotechnical Engineer.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to optimum or to 3 percent over optimum moisture content for clay soils, or within 2 percent of optimum moisture content for granular soils. Refer to geotechnical study for additional recommendations.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content beyond the tolerances described above and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 - 1. Under exterior flatwork, slabs, steps, and pavements, scarify and recompact top 8 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Underfootings and interior floor slabs, excavate to approved natural soils, in fill condition, compact to 95 percent.
 - 3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 90 percent.
 - 4. Compact foundation wall backfill to 95 percent.
 - 5. Compact scarified subgrade soils to 95 percent.
 - 6. Compact retaining wall backfill to 95 percent.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 0.10 feet.
 - 2. Walks: Plus or minus 0.10 feet.
 - 3. Pavements: Plus or minus 0.10 feet.
 - 4. Grading inside Building Lines: Finish subgrade to a tolerance of ½-inch when tested with a 10-foot straightedge.

3.17 SUBBASE AND BASE COURSES

- A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase and base course under pavements and walks as follows:
 - 1. Install separation geotextile, if requested by Geotechnical Engineer, on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Place base course material over subbase course under hot-mix asphalt pavement.
 - 3. Shape subbase and base course to required crown elevations and cross-slope grades.

4. Place subbase and base course 6 inches or less in compacted thickness in a single layer.
 5. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 6. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
- C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.18 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Owner's Representative.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Perform field moisture tests in accordance with ASTM D 3017. Tests will be performed at the following locations and frequencies at a minimum:
 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Owner's Representative; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

END OF SECTION 312000

SECTION 312270 – TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included. Furnish, install, maintain, and remove temporary erosion and sedimentation controls as shown on the drawings or specified herein, or as required to complete the work.
- B. Related Sections include the following:
 - 1. Section 311000 "Site Clearing" site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 2. Section 312000 "Earth Moving" for soil materials, site excavating, filling and grading.
 - 3. Section 211100 "Trenching" for excavating and backfilling of utilities.
- C. Permits and Fees: Obtain and pay for all permits and fees required for the work of this section, including erosion and sediment control and water quality permits required by the Colorado Department of Public Health and Environment, Water Quality Control Division.
- D. Erosion Control: The Erosion and Sedimentation Control Drawings included in the Contract Documents is the minimum requirement to be implemented. Provide additional control as necessary to meet applicable local and State criteria.
- E. Additional information concerning temporary erosion and sedimentation control may be found on the civil drawings and City of Fruita Design Criteria and Construction Specifications Manual, latest edition. In case of conflict between the drawings, jurisdictional criteria and the information specified herein, the more stringent requirements shall govern.
- F. Additional information concerning erosion may be found in the geotechnical investigation report. All requirements of this report shall be followed unless stated otherwise.

1.2 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Unclassified Excavation: Removal of all material of whatever character required for the work encountered above subgrade elevations and to lines and dimensions indicated, including boulders.
- C. Fill: Fill is all material placed to raise the grade of the site or to backfill excavation, upon which the Soils Engineer has made sufficient tests and observations to enable him to issue a written statement that, in his opinion, the fill has been placed and compacted in accordance with the requirements of these specifications.

- D. BMP: Best Management Practice. Erosion and sediment control devices, which may consist of silt fence, hay bales, crates, filter fabric, riprap, etc.
- E. SWMP: Storm Water Management Plan. Identifies BMPs, which are erosion and sediment control measures for the project.
- F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- H. Utilities: Include on-site underground pipes, conduits, ducts, and cables, as well as underground services to buildings.

1.3 SUBMITTALS

- A. Submittal Procedures: All submittals are to be made to the Owner's Representative. If provided refer to Division 1 section "Submittal Procedures."
- B. Product Data: Submit manufacturer's published descriptive literature and complete specifications for manufactured products specified herein and utilized on the project.
 - 1. Geotextiles.
 - 2. Erosion Control Fabric.
- C. Storm Water Management Plan:
 - 1. The Engineer will provide a Storm Water Management Plan (SWMP) and report addressing erosion and sediment control measures for all sites with over one acre of disturbed ground. The Engineer may also assist in preparation of the General Permit application.
 - 2. The Contractor is responsible for obtaining all required permits including a General Permit application for Storm Water Discharges associated with construction activities at least ten (10) days prior to start of construction. Permits are to be filed with the Colorado Department of Public Health and Environment, Water Quality Control Division.
 - 3. Contractor shall have the Storm Water Management Plan (SWMP) and report available on-site at all times.

1.4 QUALITY ASSURANCE:

- A. Regulatory Requirements: Comply with applicable local, State and Federal ordinances, rules and regulations concerning sedimentation control and storm water runoff.
- B. In case of conflict between the above codes, regulations, references and standards and these specifications, the more stringent requirements shall govern.
- C. Preconstruction Conference: Conduct conference at Project site as directed by Owner's Representative prior to start of construction. Contractor to comply with requirements, which may also be included in Division 1 Section "Project Management and Coordination."

1.5 PROJECT/SITE CONDITIONS

- A. Existing Conditions: Verify all existing conditions affecting the work of this section prior to submitting bids or proposals. Additional compensation will not be allowed for revisions or modification of work resulting from failure to verify existing conditions.

1.6 WARRANTY

- A. Temporary Erosion and Sediment Control measures shall be maintained until permanent measures are in place. All damaged, disturbed or devices filled with sediment, which may occur within the specified project warranty period, shall be corrected at no cost to the Owner. Any devices damaged by erosion or sediment shall be restored to their original condition by the Contractor, at no cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Erosion and Sedimentation Control Materials: Provide one or more of the following materials, as shown on the plans or as applicable for site conditions:
 1. Sand bags.
 2. Clean, seed-free, certified, cereal hay or grain straw bales.
 3. Silt fences.
 4. Rock riprap.
 5. Temporary seeding.
 6. Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh.
 7. Biodegradable twisted jute or spun-coir mesh, 0.92 lb/sy minimum, with 50 to 65 percent open area.
 8. Drainage geotextile.
 9. Impervious fill.
 10. Other materials proposed for use on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General:
 1. Determine the existing ground elevations, drainage patterns, and changes to such patterns during excavation in order to satisfactorily plan and provide materials for adequate erosion and sediment control devices.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and rights-of-way according to requirements of authorities having jurisdiction.

- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.
- D. Secure grading permit from agency have jurisdiction prior to commencing grading operations.

3.3 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which the work of this section will be performed. Do not proceed with the work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.

3.4 INSTALLATION

- A. Erosion and Sedimentation Control Devices. Erosion and sedimentation control measures to be taken during construction include, but are not necessarily limited to the following:
 - 1. Apply soil stabilization within 14 days to all disturbed areas that are to be dormant for a period longer than 30 calendar days after reaching grade. Stabilize soil with mulch anchored per criteria of authorities having jurisdiction.
 - 2. Roads and parking areas indicated to be paved may be covered with an appropriate aggregate base course in lieu of mulch. Temporary mulching or aggregate base course is not required if final pavement construction will take place within 30 days after grading to final contours.
 - 3. Soils that will be stockpiled for more than 30 days must be mulched and stabilized within 14 days after stockpile construction.
 - 4. Prevent sediment from leaving the project site by installing a silt fence or other BMPs as indicated on the plans. Protect existing storm inlets adjacent to the site by an approved gravel filter.
 - 5. Excavate the future detention/water quality pond and construct the outlet structure/storm sewer such that the pond may function as a temporary sediment basin during development of the site. Construct the sediment basin in accordance with authority having jurisdiction's criteria. Provide temporary swales to convey site runoff to the pond.
 - 6. Locate stone stabilization pads at all points of vehicular ingress and egress to the construction site.
 - 7. Provide temporary erosion controls consisting of berms at the top of slopes and interceptor ditches at ends of berms and at those locations which will eliminate or minimize erosion during construction, along with temporary seeding, temporary diversion, chutes, and down pipes and lining of water courses.
 - 8. Temporary sedimentation controls shall consist of silt dams, traps, silt fence, barriers, and appurtenances at the top of spoil and borrow area slopes and where runoff water exits the site.
 - 9. Maintain the available silt holding capacity of silt dams, fence traps and barriers until no longer needed. The sediment capacity of sediment retainage areas shall be at a minimum, the capacity shown on the plans in conformance with Urban Drainage Criteria Manual, Volume 3. Prior to removal, obtain concurrence of the Owner and Engineer.

10. Remove accumulated sediment and debris from a BMP when the sediment level reaches one-half the height of the BMP, or at any time the sediment or debris adversely impacts the functioning of the BMP.
11. The erosion/sediment control plan shows the minimum required for the project. If it becomes apparent that additional controls are necessary, the Engineer shall be notified and with approval of the Owner's Representative additional controls shall be installed.

B. Chemicals and Pollutants:

1. Store construction materials and chemicals that could contribute pollutants to the runoff within an enclosure, container, or dike located around the perimeter of the storage area, to prevent discharge of these materials into runoff from the construction site.
2. Locate areas used for collection and temporary storage of solid and liquid waste away from the storm drainage system. Provide covering or fencing as required to prevent windblown materials; construct perimeter dike to contain liquid runoff. These measures may not be necessary if materials are immediately placed in covered waste containers.
3. Perform equipment maintenance in designated areas using measures such as drip pans to control petroleum products spillage.
4. Immediately clean up and properly dispose of spills of construction related materials such as paints, solvents, or other chemicals.

C. Final Stabilization and Long-Term Management

1. Final stabilization shall be achieved through permanent vegetation and landscaping after construction of all buildings and paved surfaces.
2. With approval temporary erosion and sediment control measures may be removed within 30 days after final site stabilization is achieved or after temporary measures are no longer needed.

D. Inspection and Maintenance: Inspect erosion and sediment control measures weekly during construction. In addition, inspect all facilities immediately after any significant runoff or snowmelt which results in runoff. Repair or otherwise mitigate any damage to the erosion and sediment control facilities at no additional cost to the Owner.

3.5 CLEANING

- A. Removal of Controls: Remove controls upon completion of that portion of the work for which controls were furnished. Leave the site and work area in a clean condition.

END OF SECTION 312270

SECTION 321216 – ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Additional information concerning asphalt paving may be found on the civil drawings, in the project geotechnical report and City of Fruita Design Criteria and Construction Specifications Manual, latest edition. In case of conflict between the drawings, jurisdictional criteria and the information specified herein, the more stringent requirements shall govern.
- C. Additional information concerning asphalt paving may be found in the geotechnical investigation report. All requirements of this report shall be followed unless noted otherwise. The information shown in this report is for information and it shall be the contractors responsibility to field verify conditions indicated.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hot-mix asphalt paving.
 - 2. Hot-mix asphalt patching.
 - 3. Hot-mix asphalt paving overlay.
 - 4. Asphalt surface treatments.
 - 5. Cold milling of existing hot-mix asphalt pavement.
- B. Related Sections include the following:
 - 1. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling and site grading.
 - 2. Division 32 Section "Pavement Markings" for pavement striping and symbols.
- C. References:
 - 1. City of Fruita Design Criteria and Construction Specifications Manual, latest edition.
 - 2. Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, current edition and all appropriate standard special provisions.

1.3 DEFINITIONS

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. CDOT: State of Colorado Department of Transportation.

- C. CDOT Specifications: Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, current edition and all appropriate standard special provisions.

1.4 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt paving in accordance with Section 401 of the CDOT Specifications.
 - 1. Standard Specification: CDOT Specifications.
 - 2. Measurement and payment provisions and safety program submittals included in CDOT Specifications do not apply to this Project.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated, include technical data and tested physical and performance properties.
- B. Job-Mix Designs: For each job mix proposed for the Work.
- C. Material Test Reports: For each paving material.
- D. Material Certificates: For each paving material, signed by providers.

1.6 QUALITY ASSURANCE

- A. Manufacturer and Installer Qualifications:
 - 1. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
 - 2. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Testing Agency:
 - 1. All testing and inspections required herein will be performed by an independent testing and inspection agency employed by the Owner.
 - 2. Notify the testing and inspection agency not less than 48 hours in advance of all work requiring testing or inspection services.
- C. Testing Requirements: Asphalt Paving shall be tested for gradation, asphalt content and in-place density in accordance with CDOT Specifications, the current edition of CDOT Field Materials Manual, and local Regulatory Agency requirements, whichever are the most stringent.
- D. Preconstruction Conference: Conduct conference at Project site as directed by Owner's Representative. Contractor to comply with requirements, which may also be included in Division 1 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
1. Tack Coats: Minimum surface or air temperature in the shade of 60 deg F (15 deg C).
 2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
 3. Asphalt Base Course: Minimum surface or air temperature in the shade of 40 deg F and rising at time of placement.
 4. Asphalt Surface Course: Minimum surface or air temperature in the shade of 50 deg F and rising at time of placement.
- B. Coordination and Scheduling:
1. Cooperate with other trades and arrange scheduling to avoid damage to other work, including grading, site utilities and piping, exterior concrete, landscaping and irrigation systems.
 2. Before commencing pavement operations, ascertain that utility lines, site lighting and wiring, piping, curb and gutter work, general grading and heavy trucking is complete so that such operations will not damage paving work.
 3. Mask off and protect exposed building surfaces and abutting concrete from damage or staining by tack coat and paving operations.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations meeting the requirements of the CDOT Specifications.
- B. Asphalt Concrete Aggregate: Clean, hard, durable particles of crushed stone, crushed slag, crushed gravel, or natural gravel conforming to the requirements of Subsection 703.04 of the CDOT Specifications, Item 703.04, Grading SX and S (Table 703-3).
- C. Mineral Filler: Rock dust, slag dust, hydrated lime, hydraulic cement, or other suitable mineral material conforming to the requirements of Subsection 703.06 of the CDOT Specifications. Item 703.06.

2.2 ASPHALT MATERIALS

- A. Asphalt Cement: The asphalt cement to be used on this project shall be PG 64-22 conforming to the requirements of Subsection 702.01 of the CDOT Specifications.
- B. Tack Coat: AASHTO M 140, emulsified asphalt or AASHTO M 208, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- C. Fog Seal: AASHTO M 140, emulsified asphalt or AASHTO M 208, cationic emulsified asphalt, slow setting, diluted at the factory in water, of suitable grade and consistency for application.
- D. Water: Potable.

2.3 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes. Furnish job-mix formulas for each pavement type, conforming to the requirements of Subsection 401.02 of the CDOT Specifications. Mix aggregates and bituminous materials in accordance with the requirements of Subsection 401.15 of the CDOT Specifications. Use approved job mix formulas. Mix to comply with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Base Course: Grading S (75).
 - 3. Surface Course: Grading SX (75).
- B. Emulsified-Asphalt: Shall conform to AASHTO M140 or M208 in accordance with Subsection 702.03 of the CDOT Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is unfrozen, free of water, snow, and ice otherwise in suitable condition to support paving and imposed loads.
- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction. Scarify, regrade and recompact surface of subgrade that is pumping or deforming as required to provide true levels, uniform slopes and proper total thickness of paving as required in Division 2 Section "Earthwork."
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
 - 1. Mill to a depth of a minimum 1 ½-inches or as indicated on the plans.
 - 2. Mill to a uniform finished surface free of gouges, grooves, and ridges.
 - 3. Control rate of milling to prevent tearing of existing asphalt course.
 - 4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
 - 5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
 - 6. Transport milled hot-mix asphalt to asphalt recycling facility.
 - 7. Keep milled pavement surface free of loose material and dust.

3.3 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300

mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.2 gal./sq. yd. (0.2 to 0.8 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.4 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).
 - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
 - 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.5 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.20 gal./sq. yd. (0.2 to 0.8 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.6 PAVING GEOTEXTILE INSTALLATION

- A. Apply asphalt binder uniformly to existing pavement surfaces at a rate of 0.25 gal./sq. yd. (1.0 L/sq. m) per in accordance with Subsection 420.04 of the CDOT Specifications. item 420.04.
- B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches (100 mm) and transverse joints 6 inches (150 mm).
 - 1. Protect paving geotextile from traffic and other damage and place hot-mix asphalt paving overlay the same day.

3.7 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated on the plans or as directed by Geotechnical Report. Maximum lift thickness shall be 3-inches. Minimum lift thickness shall be 1½-inches for Grading SX and 2-inches for Grading S.
 - 2. Place hot-mix asphalt surface course in single lift. Maximum lift thickness shall be 2-inches.
 - 3. Spread mix at minimum temperature of 235 deg F (113 deg C) per in accordance with Subsection 401.15 of the CDOT Specifications, Table 401-4.
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
 - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.8 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150mm).
 - 3. Offset transverse joints, in successive courses, 6 to 12 inches (150-300 mm).

4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.9 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
 1. When paving surface temperature falls below 185 deg F (85 deg C) no further compaction effort will be permitted unless approved.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density in accordance with Subsection 401.17 of the CDOT Specifications.
 1. Pavement shall be compacted to a density of 92% to 96% of the maximum theoretical density, determined according to Colorado procedure 51. Field density determination will be in accordance with Colorado Procedure 44 or 81.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 1. Base Course: Plus or minus ¼ inch (6 mm).

2. Surface Course: Plus $\frac{1}{4}$ inch (6 mm), no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
 1. Base Course: $\frac{1}{4}$ inch (6 mm).
 2. Surface Course: $\frac{3}{16}$ inch (5 mm).
 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is $\frac{1}{4}$ inch (6 mm).

3.11 MANHOLE FRAME ADJUSTMENTS

- A. Set frames for manholes and other such units within areas to be paved to $\frac{1}{4}$ -inch minimum to $\frac{1}{2}$ -inch maximum below final grade as part of this work. Include existing frames or new frames furnished under other sections of these specifications.
- B. Set cover frames to $\frac{1}{4}$ -inch minimum and $\frac{1}{2}$ -inch maximum below surface of adjacent pavement. Surround frames set to grade with a ring of compacted asphaltic concrete base prior to paving. Place asphaltic concrete mixture up to 1-inch below top of frame, slope to grade, and compact with hand tamping. Adjust frames as required for paving.
- C. Provide temporary closures over openings until completion of rolling operations. Remove closures at completion of work.

3.12 ASPHALT CURBS

- A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Spread mix at minimum temperature of 250 deg F (121 deg C).
 1. Asphalt Mix: Same as pavement surface-course mix.
- B. Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.13 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.7 L/sq. m) to existing asphalt pavement and allow to cure. With a fine sand, lightly dust areas receiving excess fog seal.
- B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.
 1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.14 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.
- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 350 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- F. Asphalt Content and Gradation. Testing agency will take sample of uncompacted paving mixtures at a minimum frequency of every 1,000 tons according to Colorado Procedure – Laboratory CPL-5120 and Colorado Procedure CP-31.
- G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements. Conforming to the specified requirements will be in accordance with Subsection 105.03 of the CDOT Specifications.

3.15 DISPOSAL

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

END OF SECTION 321216

SECTION 321313 – CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes constructing exterior concrete paving on prepared subgrade or base course in accordance with these specifications. This work shall be in conformity with the lines, grades, thicknesses and typical cross-sections shown on the plans for the following:
 - 1. Driveways and roadways.
 - 2. Parking lots.
 - 3. Curbs and gutters.
 - 4. Sidewalks, steps, ramps.
 - 5. Base material for resilient surfacing.
 - 6. Dumpster and loading dock pads.
 - 7. As detailed on the plans.
- B. Related Sections include the following:
 - 1. Section 312000 "Earth Moving" for subgrade preparation, grading, and subbase course.
 - 2. Section 331373 "Concrete Pavement Joint Sealants" for expansion and contraction joints.

1.2 REFERENCES

- A. City of Fruita Design Criteria and Construction Specifications Manual, latest edition.
- B. Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, current edition.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.
- B. CDOT: State of Colorado Department of Transportation.
- C. CDOT Specifications: Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, current edition.
- D. ADA Handbook: Americans with Disabilities Act Standards for Accessible Design, U.S. Department of Justice.
- E. ANSI A117.1: Standard for Accessible and Usable Buildings and Facilities, American National Standard Institute.

- F. Refer to ACI 301: (American Concrete Institute – Standard Specifications for Structural Concrete), for additional definitions.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete pavement mix, and includes alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
 - 1. Aggregates.
 - 2. Cement.
 - 3. Admixtures.
- D. Material Certificates: Signed by manufacturers certifying that each of the following materials used in the project complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Bonding agent or adhesive.
 - 8. Joint fillers.
- E. Field quality-control test reports.
- F. Pavement Joint Layout Plan: Plan to show joint locations and typical dimensions for review and approval by engineer.
- G. Traffic Control Plan: For work in the public right-of-way.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94/C 94 M requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mix Concrete Association's (NRMCA) Plant Certification Program.

- C. Testing Agency Qualifications: An independent agency qualified according to ASTM C1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.
- E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.
- F. Concrete Testing Service: The Owner will engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- G. Preconstruction Conference: Conduct conference at project site as directed by Owner's Representative prior to start of construction. Contractor to comply with requirements, which may also be included in Division 1 Section "Project Management and Coordination."
- H. Regulatory Requirements:
 - I. Comply with City of Fruita standards for sidewalks, curbs, ramps, gutters, and driveway approaches or aprons, including standard dimensions, profiles, thicknesses, reinforcing, and compressive strength. In the event of conflict between the Contract Documents and the standards, the more stringent requirements will apply.
 - 1. Comply with applicable requirements of ADA Handbook, ANSI A117.1, and local and State codes and ordinances regarding walks, steps, ramps and curb ramps.

1.7 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Coordination and Scheduling: Coordinate with other trades and arrange scheduling to avoid damage to other work including grading, site utilities and piping, asphalt paving, landscaping and irrigation systems.
- C. Field Measurements: Verify dimensions and existing conditions shown on the drawings by taking field measurements prior to start of work. Report discrepancies to the Owner's Representative for clarification and make minor adjustments in layout as required by field conditions and as approved by the Owner's Representative, at no additional cost to the Owner.
- D. Environmental Requirements: Perform work only under suitable weather conditions. Comply with the environmental requirements of Section 3.6 for concrete placement.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
1. Use flexible or curved forms for curves of a radius 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Fabric: CDOT Section 709 and ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcement Bars: CDOT Section 709 and ASTM A 615/A 615M, Grade 60, deformed. Cut bars true to length with ends square and free of burrs.
- C. Joint Dowel Bars: Plain steel bars, CDOT Section 709 and ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- D. Tie Bars: CDOT Section 709 and ASTM A 615/A 615M, Grade 60, deformed.
- E. Supports for Reinforcement: Chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 EXPANSION JOINT FILLER

- A. Sealed Joints: Preformed, compressible fiber or cork filler material complying with ASTM D1751 or D1752, Type II, guaranteed compatible with expansion joint sealant materials, ½” thick unless otherwise indicated. Provide high-impact polystyrene removable “void cap” to create ½” deep reveal for installation of sealant.
- B. Self-Sealing Joints: Preformed, compressible asphalt fiber joint filler complying with ASTM D994, ½” thick unless otherwise indicated. Do not use asphalt fiber filler in joints to receive elastomeric joint sealants.

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
 - 1. Portland Cement: CDOT Section 701 and ASTM C 150, Type I/II.
 - a. Fly Ash: ASTM C 618, Class F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 - B. Normal-Weight Aggregates: CDOT Section 703 and ASTM C 33, coarse aggregate, uniformly graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: ¾ inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - 3. Do not use fine or coarse aggregates containing substances that cause spalling.
- C. Water: CDOT Section 712 and ASTM C 94/C 94M potable.

2.6 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Air-Entraining Admixture: CDOT Section 711 and ASTM C 260.
- C. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
 - 5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.7 CURING MATERIALS: CDOT SECTION 711

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq.yd. (305 g/sq.m) dry.
- B. Moisture-Retaining Cover: ASTM C 171, waterproof paper, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type I, Class B.
 - 1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
- F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type II, Class B.
 - 1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.

2.8 CONCRETE MIXTURES

- A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.
 - 2. Do not use Owner's field quality-control testing agency as the independent testing agency.
- B. Proportion mixes to provide concrete with the following properties:
 - 1. Compressive Strength (28 Days): 4,000 psi.
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
 - 3. Slump Limit: 4 inches (100 mm).
 - 4. Minimum 594 lb. Cement per cubic yard.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 4.0 to 7.0 percent.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture plasticizing and retarding admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

- F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals as follows:
 - 1. Fly Ash or Pozzolan: 20 percent CDOT Section 601.05.
 - 2. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 20 percent.
- G. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.
- H. Color Pigment: Color of proposed concrete to match color of existing concrete walks and curb and gutter. Add color pigment to concrete mixture according to manufacturer's written instructions.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
 - 2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
 - 3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 2 Section "Earthwork."
- C. Subgrade shall be tested by Geotechnical Engineer and pass required tests prior to concrete pavement placement.
- D. Proceed with concrete pavement operations only after non-conforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 12-inch (300-mm) overlap of adjacent mats.

3.5 JOINTS

- A. General: Construct/install construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
 - 2. Contractor to provide plan of joint placement for the Engineers approval.
 - 3. The distance between joints shall not exceed in feet, twice the pavement thickness in inches. (i.e.: 6" PCC pavement to utilize maximum 12-foot joint spacing.)
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at expansion joints.
 - 1. Contractor may utilize preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 3. Provide tie bars at sides of pavement strips where indicated.

4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
- C. Expansion Joints: Form expansion joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. Locate expansion joints in pavement where indicated on plans.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler no less than 1/2 inch or no more than 1 inch below finished surface for joint sealant.
 4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 5. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the indicated radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - ~~2.~~ Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 - ~~3.~~ Tied Contraction Joints: Install deformed bars and support assemblies at joints where indicated.

3.6 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with ACI 301 and ACI 304R requirements and recommendations for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery to the project site.
- F. Do not add water to fresh concrete after testing.

- G. Do not add water to concrete surface during finishing operations.
- H. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- I. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- J. Screed pavement surfaces with a straightedge and strike off.
- K. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.
- L. Curbs and Gutters: Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified with expansion joints at intervals of approximately [100] feet and tooled contraction joints at 10-foot intervals. When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements.
- M. Walks: Minimum 4" thick, with expansion joints as shown on plans. Tool edges to rounded profile and finish as noted herein or shown on the drawings. Contractor may utilize sawed contraction joints. Pitch walks ¼" per foot for drainage unless otherwise indicated.
- N. Ramps: Construct ramps similar to walks. Comply with applicable ADA Handbook, ANSI A117.1, and local and State codes, ordinances, and details including maximum allowable slope not to exceed 1 foot vertical in 12 foot horizontal, with maximum rise not to exceed 30" between level landings.
- O. Steps: Minimum 6" thick at intersection of treads and risers, reinforced as indicated. Slope treads ¼" to nosing, and tool nosings to uniform ½" radius. Finish as specified below.
- P. Paving: Minimum 6" thick unless otherwise indicated. Provide expansion joints as indicated on the drawings, and contraction joints at a minimum 12'-0" EWW. Place concrete paving over compacted subgrade as specified in Division 2 Section "Earthwork". Provide minimum 1% slope for drainage unless otherwise indicated.
- Q. Driveway Approaches: Minimum 6" thick, unless otherwise indicated or required by local public works standards or building codes. Construct to radius of flare indicated, and taper or warp into alignment with adjacent curbs, gutters, and walks. Place approaches over compacted subgrade as specified in Division 2 section "Earthwork." Refer to drawing and details for any reinforcing requirements.

- R. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
- Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- S. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- T. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- U. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
- V. Wet-Weather Placement: Do not begin to place concrete while rain, sleet, or snow is falling unless adequate protection is provided and, when required, acceptance of protection is obtained.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
- C. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
2. Medium-to-Course-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.
3. Burlap Drag Finish: For use on roadways and streets only. Provide a course finish by dragging a clean, unused, section of burlap fabric longitudinally across pavement.

3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection and follow the recommendations of ACI 305R for hot-weather protection during curing.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 1. Elevation: 1/4 inch.
 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 3. Surface: Gap below 10-foot- long, unlevelled straightedge not to exceed 1/4 inch.
 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.

5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each type of concrete mix. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method; one test for each compressive strength test, but not less than one test for each day's pour of each type of concrete mix.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive strength specimens.
 5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
 6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd.. One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
 7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
- C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- D. Test results shall be reported in writing to Owner's Representative, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Owner's Representative, but will not be used as the sole basis for approval or rejection.
- F. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Owner's Representative. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. Drill test cores where directed by Owner's Representative when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321350 - EXTERIOR CAST-IN-PLACE CONCRETE (OTHER THAN PAVEMENT)

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes for the following:
 - 1. Drainage Structures.
 - 2. Retaining Walls.
 - 3. Box Base Manholes.
 - 4. As indicated on the plans.
- B. Related sections include the following:
 - 1. Section 312000 "Earth Moving" for excavation and backfill.
 - 2. Section 331373 "Joint Sealants."

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Samples: For waterstops.
- E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- F. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.

2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

G. Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 308, "Standard Practice for Curing Concrete".
3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, concrete repair procedures, and concrete protection.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project
1. Portland Cement: ASTM C 150, Type I/II

The following materials may be used to supplement the portland cement in accordance with ACI 301, Section 4.
 - a. Fly Ash: ASTM C 618, Class C or F. Class C fly ash will not be permitted where Type II or I/II Portland cement is required.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, graded, 3/4-inch nominal maximum coarse-aggregate size.
1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94 and potable.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494, Type A.
 2. Retarding Admixture: ASTM C 494, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.5 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
1. Manufacturer and Type:

- a. As indicated on plans.

2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating.

2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, ½" thick unless indicated otherwise on the plans.

2.8 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 25 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
- D. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: [4000 psi] at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 ½ Percent, plus or minus 1.5 percent at point of delivery.

2.9 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information to Owner's Representative.
 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

2.11 CONCRETE MIXTURES FOR STRUCTURE ELEMENTS

- A. Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 4500 psi (31 MPa) at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit: 5 inches (125 mm), plus or minus 1 inch (25 mm).
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Provide 3/4-inch chamfer at exterior corners and edges of permanently exposed concrete, unless indicated otherwise on the plans.
- D. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
- E. Construct forms tight enough to prevent loss of concrete mortar.
- F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

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

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 80 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Owner's Representative.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the Owner's Representative.
 - 1. Place joints perpendicular to main reinforcement, continue reinforcement across construction joints, unless otherwise indicated.

3.6 WATERSTOPS

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

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Owner's Representative.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to all formed concrete surfaces.

B. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated on the drawings.

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

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

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to all horizontal top slab surfaces unless indicated otherwise.
- C. Broom Finish: Apply a broom finish to all surfaces exposed to pedestrian use unless otherwise indicated.

3.10 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

- a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
- a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

3.11 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Owner's Representative. Remove and replace concrete that cannot be repaired and patched to Owner's Representative's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Owner's Representative.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or

that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Owner's Representative's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Owner's Representative's approval.

3.12 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each type of concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each compressive strength test, but not less than one test for each day's pour of each type of concrete mix.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive strength specimens.
 5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
 6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd.. One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
 7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
- C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- D. Test results shall be reported in writing to Owner's Representative, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, concrete type and class, location of concrete batch in pour, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Owner's Representative, but will not be used as the sole basis for approval or rejection.
- F. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Owner's Representative. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
- G. Remove and replace concrete where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 321350

SECTION 321363 – PAINTED PAVEMENT MARKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following: Furnish and install all painted lines, directional arrows, handicapped symbols, or similar markings on paved surfaces, as shown on the drawings or specified herein, as required by jurisdiction having authority, and as required to complete the work.
- B. Related sections include the following:
 - 1. Division 32 Section “Concrete Paving” for materials, installation and minimum requirements.

1.3 REFERENCES

- A. Reference Standards: Comply with the requirements of the reference standards noted herein, except where more stringent requirements are described herein or otherwise required by the Contract Documents.
- B. City of Fruita Design Criteria and Construction Specifications Manual, latest edition.
- C. Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, current edition.
- D. “Manual on Uniform Traffic Control Devices” latest edition.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer’s published descriptive literature and complete specifications for products specified herein.

1.5 QUALITY ASSURANCE

- A. Qualifications: Pavement marking applicator shall be regularly engaged in this type of work, and shall provide adequate, experienced manpower and proper equipment to complete the work.
- B. Regulatory Requirements: Comply with applicable provisions of Colorado State Department of Highways Specification Sections 627, 708, and 713.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials in manufacturer's original, unopened containers, with labels intact and legible.

1.7 PROJECT CONDITIONS

- A. Environmental Requirements: Do not apply pavement marking when ambient air and pavement surface temperature is below 40°F for paint and below 50°F for epoxy and thermoplastic marking materials, or when moisture in any form is present on the pavement surface.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Traffic Marking Paint: Alkyd-based, lead and chromate free, ready-mixed, cold-applied traffic marking paint complying with FS TT-P-115E and AASHTO M-248, Type N or F as determined by traffic requirements, white or yellow color as designated on the plans for striping and lane markings, white and blue at international handicapped parking symbols. Acceptable products include Devco "Traffic Line" and Sherwin Williams "ProMar Traffic Marking Paint."
- B. Thermoplastic Marking Material: Reflectorized thermoplastic pavement striping materials composed of pigment, filler, resins, and glass reflecting spheres, conforming to AASHTO M-249, white or yellow as designated on the plans or as required by applicable public works requirements.
- C. Preformed Thermoplastic Pavement Marking: Markings shall consist of a resilient white or yellow thermoplastic product with glass beads uniformly distributed. Capable of being affixed to bituminous pavement by heating and applied to concrete per manufacture recommendations.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which the work of this Section will be performed. Do not proceed with the work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.

3.2 PREPARATION

- A. Surface Preparation: Allow fresh pavement surfaces to weather at least 30 days prior to application of traffic marking paint.

3.3 APPLICATION

- A. Traffic Marking Paint: Unless otherwise indicated, apply traffic marking paint in nominal 4" wide stripes at the rate of 100 to 110 sf/gal.

- B. Patterns and Symbols:
 - 1. Unless otherwise indicated, apply traffic markings in nominal 4" wide stripes with clear and sharp dimensions. See drawings for striping patterns, directional arrows and symbols.
 - 2. Unless otherwise indicated, use yellow markings at lane striping and directional symbols, white markings at parking striping and white and blue markings at international handi-capped symbols.
 - 3. Comply with ANSI 117.1 and ADA requirements for graphic symbols, stall widths, and access aisles at handicapped parking spaces. Provide approved templates for symbols and directional arrows.

- C. Thermoplastic Marking Material:
 - 1. Apply in molten state or by flame-spray methods as applicable for material type.
 - 2. Apply molten material to uniform dimension and line thickness of 1/8" to 3/16".
 - 3. Apply flame-spray powder at the rate of 14 to 21 oz per 30 seconds.

END OF SECTION 321363

SECTION 321540 - CRUSHED STONE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Gravel/Crusher Fines Paving.
 - 2. Edge restraints.
- B. Related Sections:
 - 1. Section 312000 "Earthmoving" for excavation and subgrade preparation and materials.
 - 2. Section 329300 "Plants" for metal edge restraints and adjacent planting.
 - 3. Section 329200 "Turf and Grasses" for adjacent turf and native planting.

1.3 REFERENCES

- A. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

1.4 ACTION SUBMITTALS

- A. Product Data for the following:
 - 1. Edge restraints.
 - 2. Herbicide.
 - 3. Geotextile.
- B. Sieve Analyses: For each type of gravel paving, according to ASTM C 136.
- C. Samples for the following:
 - 1. Gravel Paving: For each type indicated, provide 1-quart volume in sealed plastic bag labeled with composition and source of material. Each Sample shall be typical of the lot of material to be furnished. Provide an accurate representation of color, texture, and size for full range available.
 - 2. Edge restraints: minimum 12-inch length by full height and thickness, including anchoring stakes. Edge Restraints: To verify color selected.
 - 3. Geotextile: 12 inches square.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of crushed stone surfacing during a calendar year. Submit before obtaining Substantial Completion.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved for installation of products required for this Project.
 - 1. Provide documented experience, on a minimum of three Projects of similar size and scope of work, indicating successful implementation.
- B. Manufacturer: Company specializing in manufacturing Products of this Section with minimum 15 years documented experience.
- C. Source Limitations: Obtain each type of Product from single manufacturer.
 - 1. Supply materials from regional manufacturer.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of paving system of a size not less than 48 inches by 48 inches.
 - a. Gravel/Crusher Fines Paving

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Bagged Materials: Accept delivery of materials only in unopened and undamaged containers bearing the brand name and manufacturer's identification.
- B. Bulk Materials: Each load of decomposed granite surfacing material arriving at the job site in bulk shall be accompanied by a delivery ticket containing the following minimum information:
 - 1. Quarry of origin.
 - 2. Amount, weight, and type of material.
 - 3. Brand name and manufacturer's identification.

- C. Protect materials from contamination until ready for installation. Store on elevated platforms, under cover and in a dry location.

1.9 FIELD CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace work damaged by frost or freezing.
- B. Wet-Weather Protection: Do not install on base or subbase courses that are muddy or saturated with standing water. Perform work in dry weather when subgrade is sufficiently stable to be properly compacted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 MATERIALS

- A. Gravel/Crusher Fines Paving (Pedestrian):
 - 1. Crushed Aggregate
 - 2. Top Lift: Sound natural irregular and angular stone, 1/4-inch minus crusher fines/cinder/rock dust and as follows:

Sieve Size % Passing	
Particle Size	% of Passing
3/8"	100%
#4	90-100%
#8	75-80%
#16	55-65%
#30	40-50%
#50	25-35%
#100	15-20%

#200 to	10-15%
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3. Bottom Lift: Sound natural irregular and angular stone.
4. Color: To be selected by Landscape Architect from Suppliers full range.

2.3 ACCESSORIES

- A. Steel Edge Restraints: Painted steel edging, 3/16 inch thick by 4 inches high, with loops pressed from or welded to face to receive stakes at 36 inches o.c., and with steel stakes 15 inches long for each loop.
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Border Concepts, Inc.
 - b. Collier Metal Specialties, Inc.
 - c. Russell, J. D. Company (The).
 - d. Sure-loc Edging Corporation.
 - e. Pro-Steel.
 2. Color: Black.

2.4 AGGREGATE SETTING-BED MATERIALS

- A. Stone Screenings for Joints: Sound stone screenings complying with ASTM D 448 for Size No. 10.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications; made from polyolefins or polyesters, with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 1. Survivability: Class 2, AASHTO M 288.
 2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
 3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
 4. UV Stability: 50 percent after 500 hours' exposure, ASTM D 4355.
- C. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive crushed stone surfacing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Excavation, General: Excavate to depth required so edges of crushed stone surfacing will match adjacent grades and have a maximum cross slope of 2 percent. Ensure edges and bottom of excavation are in smooth and even line.
- B. Prepare aggregate base and subgrade in accordance with requirements in Section 312000 "Earth Moving".
 - 1. Install geotextile fabric as indicated on Drawings and in accordance with manufacturer's written instructions. Do not extend beyond limits of crushed stone surfacing.
- C. Install edge restraints in accordance with manufacturer's written instructions and flush with adjacent finish grade unless otherwise indicated on Drawings or directed by Architect. Provide sufficient stakes to secure in place.

3.3 INSTALLATION OF GRAVEL/CRUSHED STONE SURFACING

- A. Place crushed stone surfacing material over prepared base to depth as indicated on Drawings, not exceeding 4-inch lifts, and spread smoothly and evenly. Allow for 20- to 25-percent compaction. Screed if required. Do not proceed if subgrade is deficient or not approved by Landscape Architect. Contractor is responsible for correcting deficiencies at no additional cost to the Owner.
- B. Place separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
- C. Place aggregate base according to requirements in Section 02235 "Crushed Base Course" and to thickness indicated on Drawings.
- D. Install edge restraints as indicated on Drawings.
 - 1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after stone paving installation.
 - 2. Install edge restraints before placing gravel paving.
 - 3. For metal edge restraints with top edge exposed, drive stakes at least 1 inch below finish surface.
- E. Place crushed aggregate course/gravel paving and screed to thickness indicated on Drawings, taking care that moisture content remains constant and density is loose and constant until compacted.
 - 1. Compact to a minimum density of 95 percent.
- F. Lines and Levels: Install aggregate course true to grade, properly coinciding with adjacent work and elevations with a maximum 2% cross slope.

1. Do not create low points for water to pond.
2. All surfaces shall be flush and meet smoothly and evenly.

H. Provide a finished surface uniform in texture and appearance.

3.4 PROTECTION, CLEANING AND REPAIRS

- A. Take all precautions necessary to protect completed work until Substantial Completion of Project.
- B. Thoroughly clean all areas where work has occurred. Remove from site and legally dispose excess material, debris, and rubbish.
- C. Repair or remove and replace crushed stone surfacing that is not in compliance with approved Mockups or to the satisfaction of the Landscape Architect. Provide new crushed stone surfacing to match adjoining crushed stone surfacing or meet the requirements of the Project with no evidence of replacement.

END OF SECTION 321540

SECTION 321816.13 - PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Engineered Wood Fiber.
 - 2. Poured-in-Place Rubber Surfacing.

1.3 DEFINITIONS

- A. Definitions in ASTM F2223 apply to Work of this Section.
- B. Critical Height: Standard measure of shock attenuation according to ASTM F2223; same as "critical fall height" in ASTM F1292. According to ASTM F1292, this approximates "the maximum fall height from which a life-threatening head injury would not be expected to occur."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of exposed finish.
 - 1. Include Samples of accessories involving color selection.
 - 2. Unitary, Seamless Poured-in-Place Rubber Surfacing: Minimum 6 by 6 inches.
 - 3. Loose-Fill Surfacing: Minimum 1 quart.
 - 4. Edging: 6 inches long by full width and cross section.
 - 5. Stabilizing Mats: Minimum 12 by 12 inches
 - 6. Drainage/Separation Geotextile: Minimum 12 by 12 inches.
 - 7. Drainage Panel: Minimum 6 by 6 inches.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each type of loose-fill surfacing.
- C. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground protective surfacing to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Loose Fill: Amount equal to 1 percent of amount installed.
 - 2. Edging Units: 12 full-size units.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for materials and execution.
 - 1. Build mockups for protective surfacing including accessories.
 - a. Size: 48 inches by 48 inches
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.9 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of protective surfacing that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Reduction in impact attenuation as measured by reduction of critical fall height.
 - b. Deterioration of protective surfacing and other materials beyond normal weathering.
 - 2. Warranty Period: One year from date of Substantial Completion or as specified by Manufacturer, see product specifications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain protective surfacing materials from single source from single manufacturer.

PERFORMANCE REQUIREMENTS

- B. Impact Attenuation: Critical fall height tested according to ASTM F1292.
- C. Accessibility Standard: Minimum surfacing performance according to ASTM F1951

2.2 POURED-IN-PLACE RUBBER SURFACING

- A. Basis of Design Product: GT IMPAX POURED (Poured in Place Rubber), or approved equal.
- B. Description: Manufacturer's standard, site-mixed and applied, two-layer material with wearing layer over cushioning layer, with combined, overall thickness as required, tested for impact attenuation according to ASTM F1292 and for accessibility according to ASTM F1951.
 - 1. Wearing Layer: Formulation of EPDM rubber particles or polyurethane granules, binder, and other organic and inorganic components.
 - 2. Cushioning Layer: Formulation of recycled SBR particles and binder.
 - 3. Binder: Weather-resistant, UV-stabilized, flexible, nonhardening, 100 percent solids polyurethane.
 - 4. Critical Height: Not less than as required for critical height indicated in Playground Manufacturer Drawings.
 - 5. Overall Thickness: Not less than as indicated on Drawings.
 - 6. Primer/Adhesive: Manufacturer's standard primer and weather-resistant, moisture-cured polyurethane adhesive suitable for unit, substrate, and location.
 - 7. Wearing Layer Color(s): Black (50%), Green (50%), as selected by Landscape Architect from manufacturer's full range.

2.3 ENGINEERED WOOD FIBER SURFACING

- A. Basis of Design: GT IMPAX FIBER or approved equal.
 - 1. Engineered Wood Fiber Surfacing ASTM F2075; containing no bark, leaves, twigs, or foreign or toxic materials; tested for accessibility according to ASTM F1951.
 - 2. Overall Thickness: Not less than as indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for subgrade elevations, slope, and drainage and for other conditions affecting performance of the Work.
 - 1. Verify that substrates are sound and without high spots, ridges, holes, and depressions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates to receive surfacing products according to protective surfacing manufacturer's written instructions.

3.3 INSTALLATION OF LOOSE-FILL SURFACING

- A. Apply components of loose-fill surfacing according to manufacturer's written instructions to produce a uniform surface.
- B. Loose Fill: Place loose-fill materials to required depth after installation of playground equipment support posts and foundations.
- C. Finish Grading: Hand rake to a uniformly smooth finished surface and to required elevations.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests.
- B. Playground protective surfacing will be considered defective if it does not pass tests.
- C. Prepare test reports.

END OF SECTION 321816.13

SECTION 323119 - DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fence Type 1

B. Related Requirements:

1. Section 033053 "Miscellaneous Cast-in-Place Concrete" for concrete post concrete fill.
2. Section 312000 "Earth Moving" for subgrade preparation and materials.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fencing and gates.

1. Include plans, elevations, sections, post spacing, and grounding details.
 - a. Fence Type 1

C. Samples: For each fence material and for each color specified.

1. Provide samples 12 inches in length for linear materials.
2. Powder Coat Finish for Each Separate Color.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For gate operators to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Include one panel and two posts of fence complying with requirements.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 DECORATIVE STEEL FENCES

- A. Decorative Steel Fences: Fences made from steel tubing and shapes.
 1. Basis of Design: Fortress Building Products, 1720 N 1st Street, Garland, TX 75040, or approved equal.
 2. Phone number: 1-866-323-4766.
 3. Panel Style: Flat Top; Two Rail Panels
 4. Height: 34"
 5. Length: 90.5"
 6. Color: Gloss Black
- B. Posts: Square steel tubing.
 1. Basis of Design: Fortress Building Products, 1720 N 1st Street, Garland, TX 75040, or approved equal.
 2. Phone number: 1-866-323-4766.
 3. Post Style: Without Base
 4. Size: 4"
 5. Length: 72"
 6. Color: Gloss Black
- C. Post Caps:
 1. Basis of Design: Fortress Building Products, 1720 N 1st Street, Garland, TX 75040, or approved equal.
 2. Phone number: 1-866-323-4766.
 3. Post Cap Style: Pressed Dome Cap
 4. Size: 4"
 5. Color: Gloss Black
- D. Fasteners: Stainless-steel carriage bolts and tamperproof nuts.
- E. Fabrication: Assemble fences into sections by welding pickets to rails.
 1. Fabricate sections with clips welded to rails for field fastening to posts.
 2. Drill posts and clips for fasteners before finishing to maximum extent possible.
- F. Finish exposed welds to comply with NOMMA Guideline 1, Finish #4 - good-quality, uniform undressed weld with minimal splatter.
- G. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.
 1. Hot-dip galvanize posts, and rails.
 2. Hot-dip galvanize rail and picket assemblies after fabrication.

3. Hot-dip galvanize custom-design rail and infill assemblies after fabrication.

H. Finish for Bar Grating Infill: Powder coating.

I. Finish for Steel Items Other Than Bar Grating Infill: Shop painted.

2.2 STEEL

A. Plates, Shapes, and Bars: ASTM A36/A36M.

B. Bars (Pickets): Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.

C. Tubing: ASTM A500/A500M, cold-formed steel tubing.

D. Bar Grating: NAAMM MBG 531.

1. Bars: Hot-rolled steel strip, ASTM A1011/A1011M, Commercial Steel, Type B.

2. Wire Rods: ASTM A510/A510M.

E. Uncoated Steel Sheet: Hot-rolled steel sheet, ASTM A1011/A1011M, Structural Steel, Grade 45.

F. Galvanized-Steel Sheet: ASTM A653/A653M, structural quality, Grade 50, with [G90] [G60] coating.

2.3 MISCELLANEOUS MATERIALS

A. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 321350 "Exterior Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch maximum aggregate size or dry, packaged, normal-weight concrete mix complying with ASTM C387/C387M mixed with potable water according to manufacturer's written instructions.

B. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M and specifically recommended by manufacturer for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.

B. Do not begin installation before final grading is completed unless otherwise permitted by Landscape Architect.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.
 - 1. Construction layout and field engineering are specified in Section 017300 "Execution."

3.3 DECORATIVE FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.
- B. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches plus 3 inches for each foot or fraction of a foot that fence height exceeds 4 feet.
- C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches above grade. Finish and slope top surface to drain water away from post.
 - b. Concealed Concrete: Top 2 inches below grade as indicated on Drawings to allow covering with surface material. Slope top surface of concrete to drain water away from post.
 - 3. Posts Set in Concrete: Extend post to within 6 inches of specified excavation depth, but not closer than 3 inches to bottom of concrete.
 - 4. Posts Set into Concrete in Sleeves: Use galvanized-steel pipe sleeves with inside diameter at least 3/4 inch larger than outside diagonal dimension of post, preset and anchored into concrete for installing posts.
 - a. Extend posts at least 5 inches into sleeve.
 - b. After posts have been inserted in sleeves, fill annular space between post and sleeve with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions; shape and smooth to shed water. Finish and slope top surface of grout to drain water away from post.
 - 5. Posts Set into Voids in Concrete: Form or core drill holes not less than 3/4 inch larger than outside diagonal dimension of post.
 - a. Extend posts at least 5 inches into concrete.
 - b. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink grout, mixed and placed to comply with grout

manufacturer's written instructions. Finish and slope top surface of grout to drain water away from post.

6. Mechanically Driven Posts: Drive into soil to depth of 36 inches. Protect post top to prevent distortion.
7. Space posts uniformly as

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 1. Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance not less than two full days after last trace of precipitation, without soil having been moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.
 2. Excessive Grounding Resistance: If resistance to grounding exceeds specified value, notify Architect promptly. Include recommendations for reducing grounding resistance and a proposal to accomplish recommended work.
 3. Report: Prepare test reports of grounding resistance at each test location certified by a testing agency. Include observations of weather and other phenomena that may affect test results.

END OF SECTION 323119

SECTION 323300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Bench Type 1.
 - 2. Picnic Table Type 1.
 - 3. Bike rack.
- B. Related Requirements:
 - 1. Section 321350 "Exterior Cast-in-Place Concrete" for installing anchor bolts cast in concrete footings.
 - 2. Section 312000 "Earth Moving" for excavation for installing concrete footings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each color and texture specified.
- C. Samples for Initial Selection: For units with factory-applied finishes.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE BENCH

- A. Basis of Design: Concrete Backless Bench model SB72 as manufactured by Belson Outdoors LLC, Naperville, IL, 630-897-8489, or approved equal.
 - 1. Size: Width - 24"; Height - 17"; Length – Varies: 48" and 72". See Plans.
 - 2. Materials: Steel-reinforced concrete with water repellent sealer.
 - 3. Color: Dove Gray, Smooth finish.

2.2 PICNIC TABLE

- A. Basis of Design: Natural Heavy-Duty ADA Accessible Rectangular Table as manufactured by UltraSite, a PlayCore Company, 1675 Locust St., Red Bud, IL 62278, or approved equal.
 - 1. Size: Length – 8’
 - 2. Finish: Wood
 - 3. Shape: Rectangle
 - 4. Frame Color: Black – Powder Coated.
 - 5. Wook Plank Color: ‘Pressure Treated’

2.3 BIKE RACK

- A. Basis of Design: Bola Bike Rack as manufactured by Landscape Forms, Inc, Kalamazoo, MI, 800-430-6209, or approved equal.
 - 1. Size: Depth – 2” ; Height – 32” ; Length – 28”
 - 2. Materials: 304 Stainless steel tubing with powder coated finish (ASTM A513 carbon Steel). Outside diameter 1.5” ; wall thickness 0.12”.
 - 3. Color: Landscape Forms ‘Black’ powder coat finish
 - 4. Installation method: Install per manufacturer recommendation, details and specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

END OF SECTION 323300

SECTION 328433 - IRRIGATION – DESIGN/ BUILD

1.1 SUMMARY

- A. Planting irrigation system shall be a design-build approach by the landscape contractor for a new permanent in-ground, automatic operation or manual operation irrigation system compatible with and tied into the existing irrigation system for the property. The water supply for the renovated system will be based off the City’s potable water system. The landscape contractor shall coordinate with the owner to understand the conditions of water supply and usage and requirements for irrigation and comply as required.

The new irrigation system shall contain new infrastructure and controls (e.g., mainline and lateral piping and fittings, sleeves, sprinkler heads, bubblers, drip tubing, valves, and pumps controllers, including controller and control wires, backflow preventers, quick couplers, valves, meters, yard boxes etc. and other appurtenances as required. Phase 1 (and other phases) of the Project may include temporary watering by a water truck and tying into adjacent existing irrigation system as necessary.

1.2 SYSTEM DESIGN shall comply with the following at a minimum.

- A. Irrigation system design, engineering and installation shall comply with requirements of City of Fruita.

1.3 QUALITY ASSURANCE

- A. Landscape contractor shall submit the following to the Owner prior to construction for review and approval:
1. Shop Drawings: Fully engineered and shall include all necessary plans, details, engineering, including electrical power source location, wiring diagrams, analysis data, and calculations, and specifications required to provide a complete, in-place, 100-percent coverage, and fully operational irrigation system for the proposed and existing planting areas.
 2. Product Data: For each type of proposed product.
 3. Samples: For each type of proposed product.
- B. Landscape contractor shall furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the irrigation system, and guarantee/warranty as specified herein. Items of work specifically included are:
1. Procurement of all applicable licenses, permits, and fees.
 2. Coordination of utility locates prior to construction.
 3. Verification of water supply and irrigation usage, and static pressure.
 4. Sleeving for irrigation pipe and wire.
 5. Coordinating design of irrigation system with proposed overall and phased planting design, existing and proposed hardscape design, existing planting areas to remain, and requirements of owner.

- a. Landscape contractor shall coordinate regularly with Landscape Architect to verify proposed planting design intent for the property.

1.4 CONSTRUCTION AND PROJECT CLOSEOUT

- A. During construction, landscape contractor shall stake the following for review and approval by the Owner prior to installation:
 1. Backflow preventer
 2. Irrigation controller
 3. Valve and other yard boxes, including quick couplers
- B. Upon completion of the installation, landscape contractor shall:
 1. Conduct a start-up test of irrigation system with owner for each planting area to confirm 100 percent coverage, completeness of and functionality of system and compliance with jurisdictional requirements. Landscape contractor shall adjust or repair any components that do not meet the satisfaction of the owner at no additional cost to the owner.
 2. Conduct Project Closeout upon acceptance by the owner including the following:
 - a. Furnish complete as-built drawings and specifications, including cut-sheets and spare parts, as necessary, for the irrigation system.
 - b. Furnish an Operations and Maintenance (O&M) Manual including training of the owner on the operation and maintenance of the renovated irrigation system.

END OF SECTION 328433

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes planting soils specified by composition of the mixes.
- B. Related Requirements:
 - 1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
 - 2. Section 312000 "Earth Moving" for excavation, filling and backfilling, and rough grading.
 - 3. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
 - 4. Section 329300 "Plants" for placing planting soil for plantings.

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- B. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- C. Imported Soil: Soil that is transported to Project site for use.
- D. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.
- E. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
- F. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

- H. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- I. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- J. USCC: U.S. Composting Council.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for application and use.
 - 2. Include test data substantiating that products comply with requirements.
 - 3. Include sieve analyses for aggregate materials.
 - 4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:
 - a. Manufacturer's qualified testing agency's certified analysis of standard products.
 - b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
 - c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
- B. Samples: For each bulk-supplied material, 1-gal. volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For each testing agency.
- B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Do not move or handle materials when they are wet or frozen.
 - 4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.1 SAND

- A. Sand: Fine concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.3 and 3.1.
 - 1. Sands shall be clean, sharp, natural sands free of limestone, shale and slate particles. Sand pH shall be lower than 7.5.
 - 2. Provide the following particle size distribution:

Sieve:	Percent Passing:
3/8" (9.5mm)	100
No. 4 (4.75mm)	95-100
No. 8 (2.36mm)	80-100
No. 16 (1.18mm)	50-85
No. 30 (.60mm)	25-60
No. 50 (.30mm)	5-30
No. 100 (.15mm)	0-10

Retain one of two paragraphs below if soil conditioners that increase water retention and compaction resistance and enhance cation exchange capacity are required. Applications are usually limited to golf-course greens and highly trafficked sports fields. A typical soil mix for such use consists of 10 percent by volume of diatomaceous earth or zeolites with sand. Calcined clay is another commercially available inorganic soil amendment. Delete both paragraphs and insert description of calcined clay or other commercially available soil conditioner if required.

2.2 COMPOST

- A. Compost shall be mature, stable, weed free, and produced by aerobic decomposition of organic matter. Compost shall be composed of but not limited to animal manures and bedding, hard and soft tree waste, coffee waste, and cotton waste. The product must not contain substances

toxic to plants, or over 5% sand, silt, clay or rock material by dry weight. The product shall possess no objectionable odors. The product must meet all applicable USEPA CFR, Title 40, Part 503 Standards for Class A biosolids. The moisture level shall be such that no visible water or dust is produced when handling the material.

1. Compost shall be dark brown in color, approximately the color of dark chocolate candy (70% chocolate). Black compost and compost the color of milk chocolate shall be rejected.
2. Compost shall have a strong aerobic (sweet) odor. Compost lacking a strong aerobic odor or which has an anaerobic (sour) odor shall be rejected.
3. Testing: The results of the Compost analysis shall be provided by the Compost Supplier and approved by the Owner prior to delivery of the Compost.

Compost is a widely used bulk organic soil amendment and a recycled product. Because it is applied at much greater rates than fertilizer, compost has a significant cumulative effect on nutrient availability and may reduce or eliminate initial fertilization. Consider each plant's pH and soluble salt requirements and how they relate to the compost being used and the resulting soil-compost mix.

- B. Compost shall meet the requirements of the US Composting Council Seal of Testing Assurance (STA) program - www.compostingcouncil.org - and the following requirements:

The compost shall be the result of the biological degradation and transformation of plant-derived materials under conditions designed to promote aerobic decomposition. The material shall be well composted and free of viable weed seeds. The compost shall have no visible free water and produce no dust when handled. It shall meet the following criteria:

- 100 percent of the material must pass through a 3/4-inch screen.
 - The pH of the material shall be between 6 and 8.
 - Manufactured inert material (plastic, concrete, ceramics, metal, etc.) shall be less than 1.0 percent by weight.
 - The organic matter content shall be between 35 and 65 percent.
 - Soluble salt content shall be less than 6.0 mmhos/cm.
 - Germination (an indicator of maturity) shall be greater than 80%.
 - Stability shall be between classes 5-7.
 - Carbon/nitrogen ratio shall be less than 25:1.
 - Trace metals test result = "pass."
- Chemical contaminants shall meet or exceed US EPA Class A standard, 40 CFR§ 503.13, Tables 1 and 3 levels.

Compost testing methodologies and sampling procedures shall be as provided in Test methods for the Examination of Composting and Compost (TMECC), as published by the US Composting Council.

2.3 EXISTING SITE SOIL

- A. Existing Site Soil: Salvaged during excavation process and stockpiled on-site for reuse as backfill. Existing site soil shall be amended to create planting soils.
 - 1. Excess site soil not used in Project shall be legally disposed of off-site.

2.4 ORGANIC SOIL AMENDMENTS

- A. Rice Hull: Aged and/or composted.
- B. Pine Fines: Aged, finely ground pine mulch or byproduct of screened, aged pine bark nuggets.
- C. River Organic Matter Detritus: Dredged from river bottom.
- D. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.
- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.5 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as required.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

2.6 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.

- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in a composition as recommended in the soils analysis from a qualified soil-testing laboratory.

2.7 IMPORTED AND MANUFACTURED SOILS

- A. When quantities of Existing Site Soil are insufficient, imported topsoil or manufactured topsoil from off-site sources shall be provided. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.
 - 1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones ½" inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass; not infested with nematodes, grubs, other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled, pore-space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.
 - 2. Mix imported topsoil or manufactured topsoil with soil amendments and fertilizers according to the recommendations set forth by the soils-testing laboratory soils analysis to produce planting soil.

PART 3 - EXECUTION

3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
- C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

- A. Excavation: Excavate soil from designated area(s) to a depth of 6 inches and stockpile until amended.
- B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
- C. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.

3.3 BLENDING PLANTING SOIL IN PLACE

- A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
 - 1. Preparation: Till unamended, existing soil in planting areas to a minimum depth of 12 inches to 18 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally Mix fertilizer with planting soil no more than seven days before planting.
- B. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
 - 1. Dispose of excess subsoil and unsuitable materials on-site were directed by Owner.

END OF SECTION 329113

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Seeding.
2. Hydroseeding.
3. Turf renovation.
4. Erosion-control materials.

- B. Related Requirements:

1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.
2. Section 328433 "Irrigation Design-Build" for permanent in-ground and temporary above-ground watering system for planting, turf and grasses.
3. Section 329113 "Soil Preparation" for planting soils.
4. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.
- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 PREINSTALLATION MEETINGS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- C. Product Certificates: For fertilizers, from manufacturer.
- D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
 - 1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
 - 2. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Accompany each delivery of bulk materials with appropriate certificates.

1.9 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
 1. Spring Planting: April 15th to October 31st
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Grass-Seed Mix: Proprietary seed mix as follows:
 1. Products: Subject to compliance with requirements, provide the following:
 - a. Buffalo Brand Seed; 101 East 4th St. Greeley, CO 80631; 970.356.4710
 - 1) Buffalo Brand Dura-Turf Plus.
 - a) 80% Tall Fescue, Elite Varieties
 - b) 10% Kentucky Bluegrass, Aviator II
 - c) 10% Perennial Bluegrass

2.2 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 1. Composition:
 - a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 1. Composition:
 - a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 3. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply superphosphate fertilizer directly to subgrade before loosening.

2. Spread planting soil, apply soil amendments and fertilizer on surface, and thoroughly blend soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 3. Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
 - b. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 2. Do not use wet seed or seed that is moldy or otherwise damaged.
 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 6 to 8 lb/1000 sq. ft.
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

3.5 TURF RENOVATION

- A. Renovate existing turf where indicated.

- B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 - 2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- I. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
 - 1. Initial Fertilizer: Commercial fertilizer -OR- Slow-release fertilizer applied according to manufacturer's recommendations.
- J. Apply seed and protect with straw mulch as required for new turf.
- K. Water newly planted areas and keep moist until new turf is established.

3.6 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of

grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow turf-type tall fescue to a height of 2 to 3 inches.

3.7 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
3. Satisfactory Plugged Turf: At end of maintenance period, the required number of plugs has been established as well-rooted, viable patches of grass, and areas between plugs are free of weeds and other undesirable vegetation.
4. Satisfactory Sprigged Turf: At end of maintenance period, the required number of sprigs has been established as well-rooted, viable plants, and areas between sprigs are free of weeds and other undesirable vegetation.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.8 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

3.9 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

1. Seeded Turf: 90 days from date of Substantial Completion.

- a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

END OF SECTION 329200

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Plants.
2. Tree stabilization.
3. Landscape edgings.

- B. Related Requirements:

1. Section 312000 "Earth Moving" for excavation and subgrade preparation.
2. Section 329113 "Soil Preparation" for planting soils.
3. Section 015639 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
4. Section 328433 "Irrigation Design-Build" for permanent in-ground and temporary above-ground watering system for planting, turf and grasses.
5. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.
- D. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

- E. Finish Grade: Elevation of finished surface of planting soil.
- F. Planting Area: Areas to be planted.
- G. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" for drawing designations for planting soils.
- H. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- I. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- J. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- K. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 COORDINATION

- A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.5 PREINSTALLATION MEETINGS

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

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 - 2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
- B. Samples for Verification: For each of the following:
 - 1. Trees and Shrubs: Three Samples of each variety and size delivered to site for review. Maintain approved Samples on-site as a standard for comparison.

2. Organic Mulch: 1-quart volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
3. Weed Control Barrier: 12 by 12 inches.
4. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 1. Manufacturer's certified analysis of standard products.
 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
- D. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
 1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
 2. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
 1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and

- container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- D. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
1. Notify Landscape Architect of sources of planting materials 14 days in advance of delivery to site.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- B. Bulk Materials:
 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Accompany each delivery of bulk materials with appropriate certificates.
- C. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.
- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball.
- F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- G. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.11 FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 1. Spring Planting: April 15th to October 31st
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization and edgings.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 2. Warranty Periods: From date of Substantial Completion.
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

- c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
- d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.
 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

2.2 FERTILIZERS

- A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
 1. Basis of Design Product: AgSafe 20-10-5 Planting Tablets with Micronutrients, 10% Humus and Mycorrhizae as manufactured by AgriTab Corporation, Clearfield, UT, 800-398-3803 or equal.
 2. Size: 5-gram, 10-gram and 21-gram tablets.
 3. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

4. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

2.3 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 1. Type: Shredded hardwood.
 2. Size Range: 3 inches maximum, 1/2 inch minimum.
 3. Color: Natural.

2.4 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.

2.5 TREE-STABILIZATION MATERIALS

- A. Trunk-Stabilization Materials:
 1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
 2. Wood Deadmen: Timbers measuring 8 inches in diameter and 48 inches long, treated with specified wood pressure-preservative treatment.
 3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.

2.6 LANDSCAPE EDGINGS

- A. Steel Edging: Standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.
 1. Basis of Design Product: Pro-Steel 5121 Kaltenbrun Rd., Fort Worth, Texas 76119, 817-572-4959 or similar.
 2. Edging Size: 3/16 inch wide by 4 inches deep.
 3. Stakes: Tapered steel, approximately 1-1/2 inches wide by 12 inches long.
 4. Accessories: Standard end pieces, corners and J stakes.
 5. Finish: Manufacturer's standard paint.
 - a. Paint Color: Black.

2.7 MISCELLANEOUS PRODUCTS

- A. Burlap: Non-synthetic, biodegradable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
 - 3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Landscape Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."
- B. Placing Planting Soil: Place in quantity indicated and blend to depth indicated of scarified subgrade.
 - 1. Where planting area planting soil is placed adjacent to paving surfaces shovel-cut edging per 3.11 - Edging Installation shall be provided.

- C. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.
 - 1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 - 2. stock.
 - 3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 - 4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 - 5. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 - 6. Maintain supervision of excavations during working hours.
 - 7. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
- B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.
- C. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
- D. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch minimum and 2 inches maximum above adjacent finish grades.
 - 1. Backfill: Planting soil according to Section 329113 "Soil Preparation."

2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - a. Quantity: Per Manufacturer's recommendation for plant size and type.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Balled and Potted and Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch minimum and 2 inches maximum above adjacent finish grades.
1. Backfill: Planting soil according to Section 329113 "Soil Preparation."
 2. Carefully remove root ball from container without damaging root ball or plant.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - a. Quantity: Per Manufacturer's recommendation for plant size and type.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.

3.6 TREE AND SHRUB PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Landscape Architect.
- C. Prune, thin, and shape trees, and shrubs according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Landscape Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.7 TREE STABILIZATION

- A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:
 1. Upright Staking and Tying:
 - a. Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length

required to penetrate at least 18 inches below bottom of backfilled excavation and to extend to the dimension indicated on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.

2. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.8 INSTALLATION OF ROOT BARRIER

- A. Install root barrier where trees are planted within 48 inches of paving or other hardscape elements, such as walls, curbs, and walkways, unless otherwise indicated on Drawings.
- B. Align root barrier with bottom edge angled at 20 degrees away from the paving or other hardscape element and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.
- C. Install root barrier continuously for a distance of 60 inches in each direction from the tree trunk, for a total distance of 10 feet per tree. If trees are spaced closer, use a single continuous piece of root barrier.
 1. Position top of root barrier according to manufacturer's written recommendations.
 2. Overlap root barrier a minimum of 12 inches at joints.
 3. Do not distort or bend root barrier during construction activities.
 4. Do not install root barrier surrounding the root ball of tree.

3.9 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.10 PLANTING AREA MULCHING

- A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 12 inches and secure seams with galvanized pins.
- B. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Mulch trees planted in turf and fescue areas.
 - 2. Organic Mulch in Planting Areas: Apply 4-inch average thickness of organic mulch extending 12 inches beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 6 inches of trunks or stems.

3.11 INSTALLATION OF EDGING

- A. Steel Edging: Install steel edging were indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches apart, driven below top elevation of edging.
- B. Shovel-Cut Edging: Separate mulched areas from turf areas, curbs, and paving with a 45-degree, 4- to 6-inch-deep, shovel-cut edge and as indicated on Drawings.

3.12 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.13 REPAIR AND REPLACEMENT

- A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Landscape Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.
- B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction

operations that Landscape Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree of 6 inches or smaller in caliper size.

3.14 CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.15 MAINTENANCE SERVICE

- A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
 1. Maintenance Period: 12 months from date of Substantial Completion.
- B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
 1. Maintenance Period: 12 months from date of Substantial Completion.

END OF SECTION 329300

SECTION 221113 – FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Additional information concerning water distribution systems may be found on the civil drawings and City of Fruita Design Criteria and Construction Specifications Manual. In case of conflict between the drawings, jurisdictional criteria and the information specified herein, the more stringent requirements shall govern.

1.2 SUMMARY

- A. Work Included: Excavation, trenching, exploratory excavation (pothole), backfill, bedding, soil stabilization, ground water removal, connection to existing mains, and installation of pipe, fire hydrants, taps, valves, fittings, valve boxes, and all necessary appurtenances. Also includes removal and replacement of existing paving or concrete where required, haul and import of adequate backfill material to meet compaction requirements and removal of existing thrust blocks where necessary.
- B. Related Sections include the following:
 - 1. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 2. Division 31 Section "Earth Moving" for soil materials, site excavating, filling and grading.
 - 3. Division 31 Section "Temporary Erosion and Sedimentation Control" for erosion and sediment control.
 - 4. Division 22 Section "Trenching and Backfilling" for excavation and backfilling of utilities.
 - 5. Division 32 Section "Concrete Paving" for concrete pavement removal, replacement, materials and testing.
- C. Permits and Fees: Contractor to obtain and pay for all permits required for work in this Section. Pay all fees for inspections by local authorities and utility agency for work specified in this Section.

1.3 REFERENCE TO CITY OF FRUITA DESIGN CRITERIA AND CONSTRUCTION SPECIFICATIONS MANUAL

- A. All work of this section shall be performed in conformance to the current published City of Fruita Design Criteria and Construction Specifications Manual, latest edition, and as subsequently revised, which are incorporated into these specifications by reference.

Supplementary requirements may be developed by the Engineer to address project-specific conditions, which may supersede the above-referenced specification.

PART 1 - PRODUCTS (Not Used)

PART 2 - EXECUTION (Not Used)

END OF SECTION 221113

SECTION 331373 – CONCRETE PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.2 SUMMARY

A. This Section includes the following:

1. Expansion and contraction joints within cement concrete pavement.
2. Joints between cement concrete and buildings and structures.
3. Surface preparation including primers.
4. Joint backup material.

B. Related Sections include the following:

1. Section 321313 "Concrete Pavement" for constructing joints in concrete pavement.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

C. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

E. Warranty: As required by Division 1 – Warranty Section: Contractor agrees to repair or replace joint sealers (including labor, materials, and any necessary associated costs) which fail to perform as watertight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance or general durability; or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of material for exposure indicated. Provide warranty signed by Installer and Contractor.

1.4 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Work under this section shall be subject to all applicable provisions of federal, state and local rules and regulations.
- B. Applicator: Company specializing in application of sealants with five (5) years minimum experience and be acceptable to manufacturer. Manufacturer's field representative shall visit site and make suggestions.
- C. Adhesion Tests: Prior to any sealant application, perform adhesion tests as directed by sealant manufacturer's technical representative.
- D. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Install sealant materials in strict accordance with all safety and weather conditions recommended by manufacturer, product literature, or Material Safety Data Sheets. Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation. Proceed only when forecasted weather conditions are favorable for proper cure and development of high-early bond strength. Wherever joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in lower third of manufacturer's recommended installation temperature range.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Approved Sealants:

For each application, provide the grade of sealant (non-sag, self-leveling, no-track knife grade preformed, etc.) as recommended by the manufacturer for the particular condition of installation (location, joint shape, ambient temperature, and similar conditions), to achieve the best possible overall performance. Grades specified herein are for normal condition of installation.

1. Silicone Sealant: ASTM C-920-79, Type S, Class 25, Grade NS.
2. Two-Component (plus color) polyurethane low-modulus, non-sag sealant: ASTM C920-79, Type M, Class 25, Grade NS.
3. Two-Component (plus color) polyurethane self leveling sealant: ASTM C920-79, Type M, Class 25, Grade P.

2.3 HOT-APPLIED JOINT SEALANTS

- A. Single-component formulation complying with ASTM D 3405 or D1190.
 1. Refer to CDOT Standard Specification, Section 702.06 for hot-poured joint and crack sealant material requirements.
 2. Refer to CDOT Standard Specification, Section 408.01-408.03 and 412.18 for joint and crack sealant installation requirements.

2.4 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
- D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.5 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from manufacturers recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 JOINT DESIGN

- A. Sealant depth is measured at the center (thin) section of sealant bead.
- B. Install sealants to depths and widths as recommended by sealant manufacturer and as shown on the drawings. Also, conform to the following general limitations if not in conflict with sealant manufacturer's recommendations.
 1. For sidewalks, pavements and similar joints subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 5/8 inch deep nor less than 3/8 inch deep.
 2. For normal moving joints not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 5/8 inch deep nor less than 1/4 inch deep.
 3. Depth of sealant must not exceed width of joint.
 4. Sealant joints shall not be less than 1/4 inch in width and 1/4 inch in depth.
 5. Sealant joints shall not exceed 2 inches in width in a single application.

3.4 SURFACE PREPARATION

- A. Preparation work shall result in clean surfaces in all areas where sealant is to be adhered. Such surfaces shall be free of any old sealant, contaminants and impurities which are deleterious to bonding or adhesion of primers or sealant.
- B. Clean ferrous metals of all rust, mill scale and coatings by wire brush or grinding. Any equipment used to remove rust shall be free of oil contaminants.
- C. Wire brush masonry joint surfaces, then blow clean with oil free compressed air.
- D. Apply primer per manufacturer's recommendations. Allow primer to dry prior to applying sealant.
- E. Do not caulk joints until they are clean, dry, and free of dust, loose mortar, old sealant, foreign matter or other bond inhibiting materials, and in compliance with requirements of manufacturer of materials, details shown on drawings, and specific requirements of other sections of specifications.

3.5 JOINT BACKING

- A. Use joint backing to control depth of joint to specified thickness.
- B. Select joint backing size to allow for 25% compression of backing when inserted into joint.
- C. Where shown on drawings where depth of joint will not permit use of joint backing, or wherever recommended by sealant manufacturer, install bond-breaker tape to prevent three-sided adhesion.
- D. Do not leave voids or gaps between ends of joint backing units.

3.6 APPLICATION/INSTALLATION OF JOINT SEALANT

- A. Apply sealants neatly, in a good and workmanlike manner which meets following minimum requirements or standards. Specific instructions of manufacturer must also be followed.
- B. Apply sealant using a gun with proper size nozzles. Use sufficient pressure to fill all voids and joints solid to backup material, with complete wetting of all joint bond surfaces.
- C. Applied sealant shall form a full, smooth, uniform bead, free of ridges, wrinkles, sags, air pockets and embedded impurities.
- D. After joint has been completely filled with sealant, neatly tool joint sealant to eliminate air pockets or voids, and to provide a smooth, slightly concave, neat appearing finish, with sealant surface slightly below adjoining surfaces. Wetting of finished surface with not be allowed.
- E. Where horizontal joints are located between a horizontal surface and vertical surface, fill joint to form a slight cove, so joint will not trap moisture and dirt.
- F. Protect adjacent surfaces and systems from sealant material. Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- G. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- H. Tooling of Non-Sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealants from surfaces adjacent to joint.
 - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- I. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.

- J. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.7 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.8 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

3.9 JOB SITE CLEAN-UP

- A. Sealant applicator must remove all excess materials from job site.
- B. Leave all surrounding areas where joint sealant has been applied free of excess sealant, debris and foreign substances.

END OF SECTION 331373

SECTION 333113 – SANITARY SEWER COLLECTION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Additional information concerning sanitary sewer distribution systems may be found on the civil drawings and City of Fruita construction standards. In case of conflict between the drawings, jurisdictional criteria and the information specified herein, the more stringent requirements shall govern.

1.2 SUMMARY

- A. Work Included: Excavation, trenching, removal of existing manholes and piping, backfill, compaction, bedding, soil stabilization, groundwater removal, connection to existing manholes, and installation of pipe, manholes, aggregate base course and gravel where required, service wyes, service lines, asphalt removal and replacement, and all necessary appurtenances and safety precautions. Also includes removal and replacement of existing paving, concrete, topsoil and landscaping where required.
- B. Related Sections include the following:
 - 1. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 2. Division 31 Section "Earth Moving" for soil materials, site excavating, filling and grading.
 - 3. Division 31 Section "Temporary Erosion and Sedimentation Control" for erosion and sediment control.
 - 4. Division 22 Section "Trenching" for excavation and backfilling of utilities.
 - 5. Division 32 Section "Concrete Paving" for concrete pavement removal, replacement, materials and testing.
- C. Permits and Fees: Contractor to obtain and pay for all permits required for work in this Section. Pay all fees for inspections by local authorities and utility agency for work specified in this Section.

1.3 REFERENCE TO CITY OF FRUITA STANDARDS AND SPECIFICATIONS

- A. All work of this section shall be performed in conformance to the current published City of Fruita Design Criteria and Construction Specifications Manual, latest edition, and as subsequently revised, which are incorporated into these specifications by reference.

Supplementary requirements may be developed by the Engineer to address project-specific conditions, which may supersede the above-referenced specification.

PART 1 - PRODUCTS (Not Used)

PART 2 - EXECUTION (Not Used)

END OF SECTION 331313

SECTION 334000 – STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Additional information concerning storm sewer systems may be found on the civil drawings. In case of conflict between the drawings and the information specified herein, the more stringent requirements shall govern

1.2 SUMMARY

- A. This Section includes gravity-flow, STORM UTILITY DRAINAGE PIPING outside the building, with the following components:
 - 1. Cleanouts.
 - 2. Drains and inlets.
 - 3. Precast concrete and Cast-in-place concrete manholes
- B. Related sections include the following:
 - 1. Division 22 Section “Trenching and Backfilling” for excavating and backfilling of utilities.
 - 2. Division 32 Section “Cast-in-Place Concrete” for concrete structures.
 - 3. Division 32 Section “Concrete Paving” for concrete materials.
 - 4. Division 31 Section “Earth Moving” for Site Grading.
- C. Division 31 Section “Temporary Erosion and Sedimentation Control” for erosion and sedimentation control measures. Permits and Fees:
 - 1. Obtain and pay for all permits required for the work of this section.
 - 2. Pay all fees for inspections by local authorities and utility agency for work specified in this section.
- D. Existing Utilities
 - 1. It shall be the Contractor’s responsibility to excavate and verify the location (depth, horizontal alignment, etc.) of all existing utilities that may affect construction of the proposed STORM DRAINAGE line. All exploratory excavations shall occur far enough in advance to permit any necessary relocation to be made with minimum delay and to verify existing vertical and horizontal location to determine alignment for the proposed STORM DRAINAGE line. All costs incurred by the Contractor in making exploratory excavations shall be considered to be included in the unit price bid for construction of each section of STORM DRAINAGE line or the associate structures.

- E. All standard details and specifications of the utility agency shall apply as noted on the construction permit and as required by the agency.

1.3 REFERENCES

- A. Reference Standards: Comply with the requirements of the reference standards noted herein, except where more stringent requirements are described herein or otherwise required by the Contract Documents.
- B. City of Fruita Design Criteria and Construction Specifications Manual, latest edition.
- C. Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, current edition.

1.4 DEFINITIONS

- A. HDPE: High Density Polyethylene Pipe.
- B. PVC: Polyvinyl Chloride Plastic Pipe.
- C. RCP: Reinforced Concrete Pipe.
- D. RCBC: Reinforced Concrete Box culvert.
- E. CMP: Corrugated Metal Pipe.

1.5 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water. Pipe joints shall be watertight with gasketed joint.
- B. Force-Main, Pressure-Piping Pressure Rating: At least equal to system operating pressure but not less than 150 psig.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Cleanouts, inlets and area drains.
 - 2. Channel drainage systems.
 - 3. Trench drainage systems.
 - 4. Manholes.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments for the following:
 - 1. Precast concrete manholes and other structures, including frames, covers and grates.
 - 2. Cast-in-place concrete manholes and other structures, including frames, covers and grates.
 - 3. Catch Basins and Storm Water Inlets. Include plans elevations, sections, details and frames, covers and grates.
 - 4. Storm Water Detention Structures: Include plans, elevations, sections, details, frames, orifice plates, and covers.

5. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

C. Field Quality-Control Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.7 DELIVERY, STORAGE AND HANDLING

A. Do not store plastic inlets, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle catch basins and storm water inlets according to manufacturer's written rigging instructions.

E. Deliver piping in manufacture's original bundles, securely strapped, and with protective blocking as required. Label or tag each bundle with type, size and quality of material.

F. Exercise care to prevent damage to materials during loading, transportation and unloading. Do not drop pipe or fittings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE AND FITTINGS

A. Corrugated-Steel Pipe and Fittings: ASTM A 760/A 760M, Type I with fittings of similar form and construction as pipe.

1. Special-Joint Bands: Corrugated steel with O-ring seals.
2. Standard-Joint Bands: Corrugated Steel.
3. Coating: Zinc

2.3 ALUMINUM PIPE AND FITTINGS

A. Corrugated Aluminum Pipe and Fittings: ASTM B 745/B 745M, Type I with fittings of similar form and construction as pipe.

1. Special-Joint Bands: Corrugated steel with O-ring seals.
2. Standard-Joint Bands: Corrugated steel.

2.4 PVC PIPE AND FITTINGS

- A. PVC Pressure Pipe: AWWA C900, Class 200 for gasketed joints and using ASTM F 477, elastomeric seals.
 1. Fittings NPS 4 to NPS 8 (DN 100 to DN 200): PVC pressure fittings complying with AWWA C907, for gasketed joints and using ASTM F 477, elastomeric seals.
 2. Fittings NPS 10 (DN 250) and Larger: Ductile-iron, compact fittings complying with AWWA C153, for push-on joints and using AWWA C111, rubber gaskets.
- B. PVC Sewer Pipe and Fittings, NPS 15 (DN 375) 15" and Smaller: ASTM D 3034, SDR 35 with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.
- C. PVC Sewer Pipe and Fittings, NPS 18 (DN 450) 18" and Larger: ASTM F 679, T-1 wall thickness, with bell-and spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.5 HDPE PIPE AND FITTINGS

- A. ASTM D3350, AASHTO M294. Profile wall – Type S 2' minimum burial depth, 10' maximum burial depth, bell and spigot joint with water-tight, non-cleating, O-ring gasket, ASTM F477.

2.6 CONCRETE PIPE AND FITTINGS

- A. RCP Sewer Pipe and Fittings: According to the following:
 1. ASTM C 76 and ASTM C 506 and ASTM C 507 for circular, arch, and vertical and horizontal elliptical pipe, respectively. Pipe shall be Class III, Wall B, unless otherwise noted.
 2. Joints: Water tight joints meeting ASTM C443 Standard Specification for joints in circular concrete sewer and culvert pipe, using rubber gaskets.
 3. Flared End Sections: No standard specifications apply to concrete flared end sections. Provide manufactures specifications with shop drawings to Owner's Representative.

2.7 NONPRESSURE-TYPE PIPE COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443 (ASTM C 443m), rubber.
2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.8 CLEANOUTS

- A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
 1. Manufacturers:
 - a. Josam Company.
 - a. MIFAB Manufacturing Inc.
 - b. Smith, Jay R. Mfg. Co.
 - c. Wade Div.; Tyler Pipe.
 - d. Watts Industries, Inc.
 - e. Watts Industries, Inc.; Enpoco, Inc. Div.
 - f. Zurn Industries, Inc.; Zurn Specification Drainage Operation.
 2. Top-Loading Classification(s): Heavy duty.
 3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.
- B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.9 MANHOLES

- A. Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
 1. Diameter: As shown on drawings (48 inches (1200 mm) minimum, unless otherwise indicated).
 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 3. Base Section: 6-inch (150-mm) minimum thickness for floor slab and the minimum thickness as noted on plans for walls and base riser section.
 4. Riser Sections: 4-inch (100-mm) minimum thickness or as noted on the plans and the lengths to provide depth indicated.
 5. Top Section: Eccentric-cone type unless flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 6. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.

- B. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Ballast: Increase thickness of concrete, as required to prevent flotation.
 2. Resilient Pipe Connectors: ASTM C 923 cast or fitted into manhole walls, for each pipe connection.
- C. Manhole Joint Sealant: All joints in the manhole barrel, cone and/or flat top sections including the joint between the cast-in-place base slab and the bottom barrel section shall be sealed with a preformed, flexible plastic gasket conforming to the following requirements:
1. The flexible plastic gasket shall be in conformance with Federal Specification SS-S 00210, "Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints."
 2. The plastic sealing compound shall be packaged in extruded preformed rope-like shape of proper size to completely fill the joint when fully compressed. The material shall be protected by a suitable, removable, two-piece wrapper so that one wrapper may be removed as the compound is applied to the joint surface without disturbing the other wrapper, which remains attached to the compound for protection. The sealing compound shall be impermeable to water, have high immediate bonding strength to the primed concrete surface, and shall maintain permanent plasticity, resistance to water, acids, and alkalis.
 3. All surfaces of the tongue and groove joint of the manhole barrel shall be primed with an approved priming compound prior to the installation of the sealing compound. The application of the priming compound and the sealing compound shall be accomplished in strict conformance with the manufacturer's instructions, as to the method of application, quantity of material, the grade of the materials, and the application temperatures.
 4. All lifting holes shall be sealed with the plastic sealing compound.
- D. Manhole Steps: All manhole steps shall be similar and equal to those specified below and shall be installed in a straight line vertically. Manhole steps shall be cast into the wall at the same time the barrel section is cast. Except for unusual circumstances, steps which are inserted or grouted in the wall after the wall has been cast will not be accepted. Steps shall be installed with a nominal spacing of 15 inches (375-mm) and 6 inches (150-mm) from face of manhole.
1. Aluminum, Federal specification QQ-A-200/8, or ALMAG35. Two non-skid grooves in surface of step and capable of carrying load of 1000 lbs. 6 inches (150 mm) from face of manhole.
 2. Polypropylene Reinforced Plastic: ASTM Specifications.
 - a. ASTM C-478.
 - b. ASTM A-615 Grade 60 (steel rod).
 - c. ASTM 2146 69, Type II Grade 16906 (polypropylene).
- E. Manhole Grade Rings: Reinforced-concrete rings, 3-inch to 9-inch (75 to 225-mm) total thickness, to match diameter of manhole frame and cover.
1. F. Manhole Frames and Covers: Ring and cover shall have a combined weight greater than 400 lbs shall be machined to fit securely with non-rocking cover, and shall be hot-dipped in asphalt. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

- a. Material: ASTM A 48, Class 35 gray iron, unless otherwise indicated.
- b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint or hot dipped asphalt; 10-mil minimum thickness applied to all surfaces, unless otherwise indicated.

2.10 STORM WATER INLETS

- A. Gutter Inlets: Type as indicated on plans, in accordance with City of Fruita & CDOT Standard Details.
- B. Area Inlets: Type and manufacture as indicated on plans.

2.11 STORM WATER DETENTION STRUCTURES

- A. Cast-in-Place Concrete, Storm Water Detention Structures: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated on the plans.
 1. Ballast: Increase thickness of concrete, as required to prevent flotation.
- B. Precast Concrete, Storm Water Detention Structures: As designated on plans.

2.12 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
 1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi with 0.45 maximum water-cementitious materials ratio, 5-7% entrained air and maximum 4 inch slump. Refer to Section [03300] for additional information.
 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (420 MPa), deformed steel.

2.13 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides as shown in plans

- B. .Riprap Basins: Broken, irregular size and shape, graded stone according to Urban Drainage criteria.
- C. Flared End Section (FES): Precast reinforced concrete with apron and tapered sides.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Site excavation and filling are specified in Section "Earth Moving."
- B. Excavation and backfilling for utilities are specified in Section "Trenching."

3.2 PREPARATION

- A. Piping: Prior to installation, verify that insides of pipe and pipe joints are clean and free of dirt, mud, oil, shavings from cutting, or other deleterious materials.

3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate location and arrangement of underground STORM UTILITY DRAINAGE PIPING piping. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. General:
 - 1. Use only undamaged material.
 - 2. Lay pipe on firm bedding with full length of barrel fully supported. Maintain straight lines and uniform grades between invert elevations shown. Inside of pipe shall be smooth and clean.
 - 3. Begin all pipe installation at downstream end of pipe run, with lower segment of pipe in contact with specified bedding. Place bell or groove ends facing upstream.
 - 4. Plug ends temporarily during installation, until connections are made to adjoining pipe or to manholes or inlet structures.
 - 5. Trench excavation and placement and compaction of bedding and backfill are specified in Division 22 Section "Trenching."
- C. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Plug all lifting holes in pipe with approved rubber plug or grout.
- D. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

- E. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- F. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- G. Install gravity-flow, nonpressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at slopes indicated on plan.
 - 2. Install corrugated steel piping according to ASTM A798/A798M.
 - 3. Install corrugated aluminum piping according to ASTM B 788/B 788M.
 - 4. Install PVC sewer pipe according to ASTM D 2321 and ASTM F1668.
 - 5. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe installation Manual."
 - 6. Install HDPE piping per manufacturer's recommendation.

3.4 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use PVC or cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron valve boxes for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 inches by 18 inches by 6 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in pavement with tops 1/8 inch below pavement surface.

3.5 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Construct cast-in-place manholes as indicated.
- D. Manholes:
 - 1. Construct manholes in accordance with drawings and applicable agency having jurisdiction standards. Carry pipe through manhole with split pipe. Extend cast-in-place concrete manhole base at least 8 inches below pipe barrel.
 - 2. Slope floor of manhole from centerline of pipe to maximum of 2 inches above top of pipe at face of manhole. Shape invert when manhole base is poured to conform exactly to lower half of pipe.
 - 3. Form or shape inverts smooth and clean, with no obstructions. Allow insertion of an expandable plug in pipe. Construct side branches with radii as large as possible to connect to main invert.
 - 4. Extend concrete base ring minimum 3 inches above top of pipe.

5. Place future extension of pipe from manholes in manhole base. Shape invert with pipe extended to outside face of manhole base and terminated with bell of pipe as close as practical to manhole base.
6. Do not place precast manhole sections on manhole base for two days minimum after placement of concrete base. Thoroughly clean top of formed concrete base ring prior to placing manhole barrel sections.
7. Place a complete and continuous roll of sealant in groove or keyway of concrete base ring in sufficient quantity that when precast manhole barrel is placed there will be no voids. Join each succeeding precast manhole barrel in similar manner. Install sealant in groove side of tongue and groove joints.
8. Trim away all excess material and repair all lifting holes.

E. Manhole Rings and Covers:

1. Set tops of frames and covers 1/8 inch below finished surface of manholes that occur in pavements. Set tops 1 inch (25 mm) above finished surface elsewhere, unless otherwise indicated.
2. Where finished surface will be completed after manhole construction, set top of cone where a maximum of two courses of brick will be required to adjust ring and cover to final grade. Final elevations of lid will be adjusted with bricks, mortar or precast concrete rings with a minimum of 6 inches and a maximum of 18 inches of adjustment.

3.6 INLETS, OUTLETS AND CATCH BASIN INSTALLATION

A. Set frames and grates to elevations indicated.

1. Cast-in-place or precast concrete in accordance with drawings and applicable agency having jurisdiction standards. Comply with applicable requirements of Division 32 Section "Cast-in-Place Concrete."
2. Construct inverts of pipe or concrete smoothed inverts same size as pipe up to centerline of pipe. Form perimeter bench as indicated.
3. Embed steel angles or other accessories as indicated or required to anchor and support frames, grates, or covers.

B. Frames, Grates, Covers and Steps: Install accurately to placement dimensions shown on drawings. Anchor castings in place and set in adjustment mortar to assure a firm foundation.

C. Connection to Existing Structures:

1. Cut and patch or rebuild existing manhole, catch basins, or other drainage structures as required to receive new drain lines.
2. Core drill openings to receive new pipe. Chip existing bench to provide sufficient thickness for mortar bed to form new invert.
3. Seal around new pipe penetration with expandable waterstop sealant, completely filling space between pipe and cut opening to provide a watertight repair.

3.7 STORM WATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

3.8 CONCRETE PLACEMENT

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

3.9 TRENCH DRAINAGE SYSTEM INSTALLATION

- A. Assemble and install components according to manufacturer's written instructions.
- B. Install with top surfaces of components, except piping, flush with finished surface.
- C. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- D. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.
- E. Fasten grates to channel sections as indicated.
- F. Assemble channel sections with flanged or interlocking joints.

3.10 CLOSING ABANDONED STORM UTILITY DRAINAGE PIPING SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use one of procedures listed below:
 - 1. Fill pipe with stone or gravel flowfill.
 - 2. Close open ends of piping with at least 8-inch thick, brick masonry bulkheads.
 - 3. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
 - 1. Remove manhole or structure and close open ends of remaining piping.
 - 2. Remove top of manhole or structure down to at least 36-inches below final grade. Fill to within 12-inches of top with stone, gravel or sand. Fill to top with concrete.
- C. Backfill to grade according to Division 31 Section "Earth Moving" and Section "Trenching."

3.11 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section “Earth Moving.” Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.12 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.
 - 1. Submit separate report for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
 - 4. Submit separate report for each test.
 - 5. Gravity-Flow STORM UTILITY DRAINAGE PIPING Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Option: Test plastic piping according to ASTM F 1417.
 - b. Option: Test concrete piping according to ASTM C924 (ASTM C 924M).
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.13 CLEANING

- A. Clean interior of piping, inlets and manholes of dirt and superfluous materials. Flush with potable water.

END OF SECTION 334000

SECTION 334100 – STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Additional information concerning storm sewer systems may be found on the civil drawings. In case of conflict between the drawings and the information specified herein, the more stringent requirements shall govern.

1.2 REFERENCES

- A. State of Colorado, Department of Transportation (CDOT): State Department of Highways Standard Construction Specifications for Road and Bridge Construction, current edition.
- B. City of Fruita Design Criteria and Construction Specifications Manual, Latest Edition.
- C. Reference Standards: Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.

1.3 SUMMARY

- A. This Section includes gravity-flow, STORM UTILITY DRAINAGE PIPING outside the building, with the following components:
 - 1. Cleanouts.
 - 2. Drains and inlets.
 - 3. Precast concrete and Cast-in-place concrete manholes.
- B. Related Sections include the following:
 - 1. Division 22 Section “Trenching” for excavating and backfilling of utilities.
 - 2. Division 32 Section “Cast-in-Place Concrete” for concrete structures.
 - 3. Division 32 Section “Concrete Paving” for concrete materials.
 - 4. Division 31 Section “Earth Moving” for Site Grading.
 - 5. Division 31 Section “Temporary Erosion and Sedimentation Control” for erosion and sedimentation control measures.
- C. Permits and Fees:
 - 1. Obtain and pay for all permits required for the work of this section.
 - 2. Pay all fees for inspections by local authorities and utility agency for work specified in this section.

D. Existing Utilities

1. It shall be the Contractor's responsibility to excavate and verify the location (depth, horizontal alignment, etc.) of all existing utilities that may affect construction of the proposed STORM UTILITY DRAINAGE PIPING line. All exploratory excavations shall occur far enough in advance to permit any necessary relocation to be made with minimum delay and to verify existing vertical and horizontal location to determine alignment for the proposed STORM UTILITY DRAINAGE PIPING line. All costs incurred by the Contractor in making exploratory excavations shall be considered to be included in the unit price bid for construction of each section of STORM UTILITY DRAINAGE PIPING line or the associate structures.

- E. All standard details and specifications of the utility agency shall apply as noted on the construction permit and as required by the agency.

1.4 DEFINITIONS

- A. HDPE: High Density Polyethylene Pipe.
- B. PVC: Polyvinyl Chloride Plastic Pipe.
- C. RCP: Reinforced Concrete Pipe.
- D. RCBC: Reinforced Concrete Box culvert.
- E. CMP: Corrugated Metal Pipe.

1.5 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water. Pipe joints shall be watertight with gasketed joint.
- B. Force-Main, Pressure-Piping Pressure Rating: At least equal to system operating pressure but not less than 150 psig.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
 1. Cleanouts, inlets and area drains.
 2. Channel drainage systems.
 3. Trench drainage systems.
 4. Manholes.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments for the following:
 1. Precast concrete manholes and other structures, including frames, covers and grates.
 2. Cast-in-place concrete manholes and other structures, including frames, covers and grates.
 3. Catch Basins and Storm Water Inlets. Include plans elevations, sections, details and frames, covers and grates.

4. Storm Water Detention Structures: Include plans, elevations, sections, details, frames, orifice plates, and covers.
 5. Design Mix Reports and Calculations: For each class of cast-in-place concrete.
- C. Field Quality-Control Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Do not store plastic inlets, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle catch basins and storm water inlets according to manufacturer's written rigging instructions.
- E. Deliver piping in manufacture's original bundles, securely strapped, and with protective blocking as required. Label or tag each bundle with type, size and quality of material.
- F. Exercise care to prevent damage to materials during loading, transportation and unloading. Do not drop pipe or fittings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 STEEL PIPE AND FITTINGS

- A. Corrugated-Steel Pipe and Fittings: ASTM A 760/A 760M, Type I with fittings of similar form and construction as pipe.
1. Special-Joint Bands: Corrugated steel with O-ring seals.
 2. Standard-Joint Bands: Corrugated Steel.
 3. Coating: Zinc

2.3 ALUMINUM PIPE AND FITTINGS

- A. Corrugated Aluminum Pipe and Fittings: ASTM B 745/B 745M, Type I with fittings of similar form and construction as pipe.
 - 1. Special-Joint Bands: Corrugated steel with O-ring seals.
 - 2. Standard-Joint Bands: Corrugated steel.

2.4 PVC PIPE AND FITTINGS

- A. PVC Pressure Pipe: AWWA C900, Class 200 for gasketed joints and using ASTM F 477, elastomeric seals.
 - 1. Fittings NPS 4 to NPS 8 (DN 100 to DN 200): PVC pressure fittings complying with AWWA C907, for gasketed joints and using ASTM F 477, elastomeric seals.
 - 2. Fittings NPS 10 (DN 250) and Larger: Ductile-iron, compact fittings complying with AWWA C153, for push-on joints and using AWWA C111, rubber gaskets.
- B. PVC Sewer Pipe and Fittings, NPS 15 (DN 375) 15" and Smaller: ASTM D 3034, SDR 35 with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.
- C. PVC Sewer Pipe and Fittings, NPS 18 (DN 450) 18" and Larger: ASTM F 679, T-1 wall thickness, with bell-and spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.5 HDPE PIPE AND FITTINGS

- A. ASTM D3350, AASHTO M294. Profile wall – Type S 2' minimum burial depth, 10' maximum burial depth, bell and spigot joint with water-tight, non-cleating, O-ring gasket, ASTM F477.

2.6 CONCRETE PIPE AND FITTINGS

- A. RCP Sewer Pipe and Fittings: According to the following:
 - 1. ASTM C 76 and ASTM C 506 and ASTM C 507 for circular, arch, and vertical and horizontal elliptical pipe, respectively. Pipe shall be Class III, Wall B, unless otherwise noted.
 - 2. Joints: Water tight joints meeting ASTM C443 Standard Specification for joints in circular concrete sewer and culvert pipe, using rubber gaskets.
 - 3. Flared End Sections: No standard specifications apply to concrete flared end sections. Provide manufactures specifications with shop drawings to Owner's Representative.

2.7 NONPRESSURE-TYPE PIPE COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443 (ASTM C 443m), rubber.
2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.8.1 CLEANOUTS

- A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
1. Manufacturers:
 - a. Josam Company.
 - a. MIFAB Manufacturing Inc.
 - b. Smith, Jay R. Mfg. Co.
 - c. Wade Div.; Tyler Pipe.
 - d. Watts Industries, Inc.
 - e. Watts Industries, Inc.; Enpoco, Inc. Div.
 - f. Zurn Industries, Inc.; Zurn Specification Drainage Operation.
 2. Top-Loading Classification(s): Heavy duty.
 3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.
- D. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.8.2 MANHOLES

- A. Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
1. Diameter: As shown on drawings (48 inches (1200 mm) minimum, unless otherwise indicated).
 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 3. Base Section: 6-inch (150-mm) minimum thickness for floor slab and the minimum thickness as noted on plans for walls and base riser section.
 4. Riser Sections: 4-inch (100-mm) minimum thickness or as noted on the plans and the lengths to provide depth indicated.
 5. Top Section: Eccentric-cone type unless flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 6. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
- B. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Ballast: Increase thickness of concrete, as required to prevent flotation.
 2. Resilient Pipe Connectors: ASTM C 923 cast or fitted into manhole walls, for each pipe connection.
- C. Manhole Joint Sealant: All joints in the manhole barrel, cone and/or flat top sections including the joint between the cast-in-place base slab and the bottom barrel section shall be sealed with a preformed, flexible plastic gasket conforming to the following requirements:
1. The flexible plastic gasket shall be in conformance with Federal Specification SS-S 00210, "Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints."
 2. The plastic sealing compound shall be packaged in extruded preformed rope-like shape of proper size to completely fill the joint when fully compressed. The material shall be protected by a suitable, removable, two-piece wrapper so that one wrapper may be removed as the compound is applied to the joint surface without disturbing the other wrapper, which remains attached to the compound for protection. The sealing compound shall be impermeable to water, have high immediate bonding strength to the primed concrete surface, and shall maintain permanent plasticity, resistance to water, acids, and alkalis.
 3. All surfaces of the tongue and groove joint of the manhole barrel shall be primed with an approved priming compound prior to the installation of the sealing compound. The application of the priming compound and the sealing compound shall be accomplished in strict conformance with the manufacturer's instructions, as to the method of application, quantity of material, the grade of the materials, and the application temperatures.
 4. All lifting holes shall be sealed with the plastic sealing compound.
- D. Manhole Steps: All manhole steps shall be similar and equal to those specified below and shall be installed in a straight line vertically. Manhole steps shall be cast into the wall at the same time the barrel section is cast. Except for unusual circumstances, steps which are inserted or grouted in the wall after the wall has been cast will not be accepted. Steps shall be installed with a nominal spacing of 15 inches (375-mm) and 6 inches (150-mm) from face of manhole.
1. Aluminum, Federal specification QQ-A-200/8, or ALMAG35. Two non-skid grooves in surface of step and capable of carrying load of 1000 lbs. 6 inches (150 mm) from face of manhole.
 2. Polypropylene Reinforced Plastic: ASTM Specifications.
 - a. ASTM C-478.
 - b. ASTM A-615 Grade 60 (steel rod).
 - c. ASTM 2146 69, Type II Grade 16906 (polypropylene).
- E. Manhole Grade Rings: Reinforced-concrete rings, 3-inch to 9-inch (75 to 225-mm) total thickness, to match diameter of manhole frame and cover.
- F. Manhole Frames and Covers: Ring and cover shall have a combined weight greater than 400 lbs shall be machined to fit securely with non-rocking cover, and shall be hot-dipped in asphalt. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
- a. Material: ASTM A 48, Class 35 gray iron, unless otherwise indicated.

- b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint or hot dipped asphalt; 10-mil minimum thickness applied to all surfaces, unless otherwise indicated.

2.11 STORM WATER INLETS

- A. Gutter Inlets: Type as indicated on plans, in accordance with Adams County & CDOT Standard Details.
- B. Area Inlets: Type and manufacture as indicated on plans.

2.12 STORM WATER DETENTION STRUCTURES

- A. Cast-in-Place Concrete, Storm Water Detention Structures: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated on the plans.
 - 1. Ballast: Increase thickness of concrete, as required to prevent flotation.
- B. Precast Concrete, Storm Water Detention Structures: As designated on plans.

2.13 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
 - 1. Cement: ASTM C 150, Type II.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi with 0.45 maximum water-cementitious materials ratio, 5-7% entrained air and maximum 4 inch slump. Refer to Section [03300] for additional information.
 - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (420 MPa), deformed steel.

2.15 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides as shown in plans.
- B. Riprap Basins: Broken, irregular size and shape, graded stone according to Urban Drainage criteria.
- C. Flared End Section (FES): Precast reinforced concrete with apron and tapered sides.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Site excavation and filling are specified in Section "Earth Moving."
- B. Excavation and backfilling for utilities are specified in Section "Trenching."

3.2 PREPARATION

- A. Piping: Prior to installation, verify that insides of pipe and pipe joints are clean and free of dirt, mud, oil, shavings from cutting, or other deleterious materials.

3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate location and arrangement of underground STORM UTILITY DRAINAGE PIPING piping. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. General:
 - 1. Use only undamaged material.
 - 2. Lay pipe on firm bedding with full length of barrel fully supported. Maintain straight lines and uniform grades between invert elevations shown. Inside of pipe shall be smooth and clean.
 - 3. Begin all pipe installation at downstream end of pipe run, with lower segment of pipe in contact with specified bedding. Place bell or groove ends facing upstream.
 - 4. Plug ends temporarily during installation, until connections are made to adjoining pipe or to manholes or inlet structures.
 - 5. Trench excavation and placement and compaction of bedding and backfill are specified in Division 22 Section "Trenching."
- C. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Plug all lifting holes in pipe with approved rubber plug or grout.
- D. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- E. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- F. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- G. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow, at slopes indicated on plan.
2. Install corrugated steel piping according to ASTM A798/A798M.
3. Install corrugated aluminum piping according to ASTM B 788/B 788M.
4. Install PVC sewer pipe according to ASTM D 2321 and ASTM F1668.
5. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe installation Manual."
6. Install HDPE piping per manufacturer's recommendation.

3.4 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use PVC or cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron valve boxes for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 inches by 18 inches by 6 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in pavement with tops 1/8 inch below pavement surface.

3.5 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Construct cast-in-place manholes as indicated.
- D. Manholes:
 1. Construct manholes in accordance with drawings and applicable agency having jurisdiction standards. Carry pipe through manhole with split pipe. Extend cast-in-place concrete manhole base at least 8 inches below pipe barrel.
 2. Slope floor of manhole from centerline of pipe to maximum of 2 inches above top of pipe at face of manhole. Shape invert when manhole base is poured to conform exactly to lower half of pipe.
 3. Form or shape inverts smooth and clean, with no obstructions. Allow insertion of an expandable plug in pipe. Construct side branches with radii as large as possible to connect to main invert.
 4. Extend concrete base ring minimum 3 inches above top of pipe.
 5. Place future extension of pipe from manholes in manhole base. Shape invert with pipe extended to outside face of manhole base and terminated with bell of pipe as close as practical to manhole base.
 6. Do not place precast manhole sections on manhole base for two days minimum after placement of concrete base. Thoroughly clean top of formed concrete base ring prior to placing manhole barrel sections.
 7. Place a complete and continuous roll of sealant in groove or keyway of concrete base ring in sufficient quantity that when precast manhole barrel is placed there will be no voids. Join each succeeding precast manhole barrel in similar manner. Install sealant in groove side of tongue and groove joints.
 8. Trim away all excess material and repair all lifting holes.

E. Manhole Rings and Covers:

1. Set tops of frames and covers 1/8 inch below finished surface of manholes that occur in pavements. Set tops 1 inch (25 mm) above finished surface elsewhere, unless otherwise indicated.
2. Where finished surface will be completed after manhole construction, set top of cone where a maximum of two courses of brick will be required to adjust ring and cover to final grade. Final elevations of lid will be adjusted with bricks, mortar or precast concrete rings with a minimum of 6 inches and a maximum of 18 inches of adjustment.

3.6 INLETS, OUTLETS AND CATCH BASIN INSTALLATION

A. Set frames and grates to elevations indicated.

1. Cast-in-place or precast concrete in accordance with drawings and applicable agency having jurisdiction standards. Comply with applicable requirements of Division 32 Section "Cast-in-Place Concrete."
2. Construct inverts of pipe or concrete smoothed inverts same size as pipe up to centerline of pipe. Form perimeter bench as indicated.
3. Embed steel angles or other accessories as indicated or required to anchor and support frames, grates, or covers.

B. Frames, Grates, Covers and Steps: Install accurately to placement dimensions shown on drawings. Anchor castings in place and set in adjustment mortar to assure a firm foundation.

C. Connection to Existing Structures:

1. Cut and patch or rebuild existing manhole, catch basins, or other drainage structures as required to receive new drain lines.
2. Core drill openings to receive new pipe. Chip existing bench to provide sufficient thickness for mortar bed to form new invert.
3. Seal around new pipe penetration with expandable waterstop sealant, completely filling space between pipe and cut opening to provide a watertight repair.

3.7 STORM WATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

3.8 CONCRETE PLACEMENT

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

3.9 TRENCH DRAINAGE SYSTEM INSTALLATION

- A. Assemble and install components according to manufacturer's written instructions.
- B. Install with top surfaces of components, except piping, flush with finished surface.
- C. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- D. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.
- E. Fasten grates to channel sections as indicated.
- F. Assemble channel sections with flanged or interlocking joints.

3.10 CLOSING ABANDONED STORM UTILITY DRAINAGE PIPING SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use one of procedures listed below:
 - 1. Fill pipe with stone or gravel flowfill.
 - 2. Close open ends of piping with at least 8-inch thick, brick masonry bulkheads.
 - 3. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
 - 1. Remove manhole or structure and close open ends of remaining piping.
 - 2. Remove top of manhole or structure down to at least 36-inches below final grade. Fill to within 12-inches of top with stone, gravel or sand. Fill to top with concrete.
- C. Backfill to grade according to Division 31 Section "Earth Moving" and Section "Trenching."

3.11 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.12 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
 4. Submit separate report for each test.
 5. Gravity-Flow STORM UTILITY DRAINAGE PIPING Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Option: Test plastic piping according to ASTM F 1417.
 - b. Option: Test concrete piping according to ASTM C924 (ASTM C 924M).
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.
- 3.13 CLEANING
- A. Clean interior of piping, inlets and manholes of dirt and superfluous materials. Flush with potable water.

END OF SECTION 334100

SECTION 334600 – SUBDRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes subdrainage systems for the following:
 - 1. Foundations.
 - 2. Retaining walls.
 - 3. Underdrains.

1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride.

1.4 SUBMITTALS

- A. Product Data: For drainage conduit, drainage panels, and geotextile fabrics.
 - 1. Perforated pipe.
 - 2. Solid pipe.
 - 3. Geotextile fabrics.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 PIPING MATERIALS

- A. Refer to various application articles in Part 3 for applications of pipe, tube, fitting, and joining materials.

2.3 DRAINAGE PIPES AND FITTINGS

- A. Perforated, PVC Sewer Pipe and Fittings: ASTM D 3034, bell-and-spigot ends, for loose joints.

2.4 CLEANOUTS

- A. PVC Pipe: ASTM D 3034, PVC cleanout threaded plug and threaded pipe hub.
- B. Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with the following properties determined according to AASHTO M 288:
 - 1. Survivability: Class 2
 - 2. Apparent Opening Size: No. 60 (0.25-mm) sieve, maximum.
 - 3. Permittivity: 0.2 per second, minimum.
- C. Geotextile: Woven geotextile fabric, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation less than 50 percent; complying with the following properties determined according to AASHTO M 288:
 - 1. Survivability: Class 2
 - 2. Apparent Opening Size: No. 60 (0.25-mm) sieve, maximum.
 - 3. Permittivity: 0.2 per second, minimum.

2.5 SOIL MATERIALS

- A. Impervious Fill: Clay, gravel, and sand mixture.
- B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate, Size No. 57, with 100 percent passing 1-1/2-inch (37.5-mm) sieve and not more than 5 percent passing No. 8 (2.36-mm) sieve.

2.6 GEOTEXTILE FILTER FABRICS

- A. Woven or nonwoven geotextile filter fabric of PP or polyester fibers, or combination of both. Flow rates range from 110 to 330 gpm per sq. ft. (4480 to 13 440 L/min. per sq. m) when tested according to ASTM D 4491. Available styles are flat and sock.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earth Moving."

3.3 SUBDRAINAGE SYSTEM APPLICATIONS

A. NPS 4 (DN 100) Piping:

1. Perforated, PVC sewer pipe and fittings for loose, bell-and-spigot joints.

3.4 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping.

1. Install detectable warning tape over nonferrous piping and over edges of underground structures.

3.5 FOUNDATION DRAINAGE INSTALLATION

A. Bottom Impervious Fill: Place impervious fill material on subgrade adjacent to bottom of footing after concrete footings have been cured and forms removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches (150 mm) deep and 12 inches (300 mm) wide.

B. Drainage Fill: Place supporting layer of drainage fill over compacted subgrade to compacted depth of not less than 4 inches (100 mm). After installing drainage piping, add drainage fill to width of at least 6 inches (150 mm) on side away from wall and to top of pipe to perform tests. After satisfactory testing and visual inspection, cover piping to width of at least 6 inches (150 mm) on side away from footing and above top of pipe to within 12 inches (300 mm) of finish grade. Place drainage fill in layers not exceeding 3 inches (75 mm) in loose depth; compact each layer placed.

1. Before installing drainage fill, lay flat-style geotextile filter fabric in trench and overlap trench sides. After installing drainage fill, wrap top of drainage fill with flat-style geotextile filter fabric.
2. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with tape per manufacturer's recommendation.
3. After installing drainage fill, place one layer of geotextile filter fabric over top of drainage fill, overlapping edges at least 4 inches (100 mm).

C. Fill to Grade: Place native fill material over compacted drainage fill. Place material in loose-depth layers not exceeding 6 inches (150 mm). Thoroughly compact each layer. Fill to finish elevations and slope away from building.

3.6 RETAINING-WALL DRAINAGE INSTALLATION

A. Drainage Fill: Place supporting layer of drainage fill over compacted subgrade to compacted depth of not less than 4 inches (100 mm). After installing drainage piping, add drainage fill to width of at least 6 inches (150 mm) on side away from wall and to top of pipe to perform tests. After satisfactory testing, cover piping to width of at least 6 inches (150 mm) on side away from footing and above top of pipe to within 12 inches (300 mm) of finish grade. Place drainage fill in layers not exceeding 3 inches (75 mm) in loose depth; compact each layer placed.

1. Before installing drainage fill, lay flat-style geotextile filter fabric in trench and overlap trench sides. After installing drainage fill, wrap top of drainage fill with flat-style geotextile filter fabric.
 2. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with tape per manufacturer's recommendation.
 3. After installing drainage fill, place one layer of geotextile filter fabric over top of drainage fill, overlapping edges at least 4 inches (100 mm).
- B. Fill to Grade: Place native fill material over compacted drainage fill. Place material in loose-depth layers not exceeding 6 inches (150 mm). Thoroughly compact each layer. Fill to finish grade.

3.7 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
1. Foundation Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 36 inches (915 mm), unless otherwise indicated.
 2. Retaining-Wall Subdrainage: When water discharges at end of wall into storm water piping system, install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 36 inches (915 mm), unless otherwise indicated. However, when water discharges through wall weep holes, pipe may be installed with a minimum slope of zero percent.
 3. Underdrain Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 36 inches (915 mm), unless otherwise indicated.
 4. Lay perforated pipe with perforations down.
 5. Lay open-joint pipe spaced as indicated on Drawings or, if not indicated, with 1/4-inch (6-mm) space between ends. Cover top two-thirds of joint opening with open-joint screening material and tie with corrosion-resistant wire.
 6. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.
- B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.
- C. Install PVC piping according to ASTM D 2321.

3.8 PIPE JOINT CONSTRUCTION

- A. Join PVC pipe and fittings according to ASTM D 3034 with elastomeric seal gaskets according to ASTM D 2321.
- B. Join perforated, PVC pipe and fittings according to ASTM D 2729, with loose, bell-and-spigot joints.

3.9 FOUNDATION AND RETAINING WALL SUBDRAINAGE CLEANOUT INSTALLATION

- A. Install cleanouts from subdrainage piping to grade. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.
- B. In vehicular-traffic areas, use NPS 4 (DN 100) cast-iron soil pipe and fittings for subdrainage piping branch fittings and riser extensions to cleanout plug. Set cleanout frames and covers in a cast-in-place concrete anchor, 18 by 18 by 12 inches (450 by 450 by 300 mm) in depth. Set top of cleanout plug flush with grade. Cast-iron pipe may also be used for cleanouts in nonvehicular-traffic areas.
- C. In nonvehicular-traffic areas, use NPS 4 (DN 100) PVC pipe and fittings for subdrainage piping branch fittings and riser extensions to cleanout plug. Set cleanout frames and covers in a cast-in-place concrete anchor, 12 by 12 by 4 inches (300 by 300 by 100 mm) in depth. Set top of cleanout plug 1 inch (25 mm) above grade.

3.10 CONNECTIONS

- A. Where required, connect low elevations of foundation subdrainage to storm water sump pumps.

3.11 FIELD QUALITY CONTROL

- A. Testing: After installing drainage fill to top of pipe, test drain piping with water to ensure free flow before backfilling. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

3.12 CLEANING

- A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 334600

City of Fruita

Department of Public Works
Engineering Division

Reed Park Improvements Project
CIP Project #130-795-77-4730

6. Specific Skate Park Technical Specifications

**Reed Park All Wheel Park
City of Fruita, CO**

**SPECIFIC SKATE PARK TECHNICAL
SPECIFICATIONS**

June 12, 2023

PREPARED BY:



Action Sports Design, llc

12400 State Hwy 71, 350-348

Austin, TX 78738

**SPECIFIC ALL WHEEL PARK TECHNICAL SPECIFICATIONS
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**SECTION 02 00 00
SITE CONDITIONS**

PART 1 GENERAL

1.01 RELATED INFORMATION

- A. Related information and requirements are included in the General and Supplementary Conditions with regards to existing underground utilities.

1.02 INFORMATION ON SITE CONDITIONS

- A. All information obtained by the Engineer regarding site conditions, subsurface information, groundwater elevations, existing constructions of site facilities, and existing underground utilities and similar data are shown on the plans or provided herein.
- B. Information derived from inspection of topographic maps, or from plans showing locations of utilities and structures will not in any way relieve Prime General Contractor from any risk, or from properly examining the site and making such additional investigations as he may elect, or from properly fulfilling all the terms of the contract documents.

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall satisfy himself as to the nature and location of the work and the general and local conditions.
- B. The Prime General Contractor further shall satisfy himself as to the character, quality, and quantity of surface and subsurface materials to be encountered by reviewing Soils Report (if applicable) and reviewing any other pertinent information. Any new exploratory work must be approved by the Owner. Failure of the Contractor to acquaint himself with the site and all available information will not relieve him of the responsibility for properly estimating the difficulty or cost of completing the work.

The Contractor will not be responsible for inspections. Owner to provide third party inspections.

- C. The Prime General Contractor shall anticipate underground obstructions such as utility lines, concrete, water table and variation hereof due to rainfall, soil conditions and debris. No extra payment will be allowed for the removal, replacement, repair, or possible increased cost caused by underground obstructions. Any such lines or obstructions indicated on the map show only the approximate location and must be verified in the field by the Contractor. The Owner and Engineer will endeavor to familiarize the contractor with all known underground obstructions, but this will not relieve the Contractor from full responsibility in anticipating and locating all underground obstructions.
- D. Additional information
 - 1. Prior to construction, the Prime General Contractor may make their own subsurface investigations subject to time schedules and arrangements approved in advance by the Owner. Before any subsurface test holes are excavated, obtain permits from the governing agency to perform such work.

END OF SECTION 02 00 00

**SECTION 03 10 00
CONCRETE FORMWORK**

PART 1 GENERAL

1.01 DESCRIPTION

- A. Provide formwork and accessories for construction of cast-in-place concrete work.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03 20 00 - Concrete Reinforcing
- B. Section 03 30 00 - Cast-in-Place Concrete
- C. Section 03 36 00 - Shotcrete

1.03 QUALITY ASSURANCE

- A. Design Criteria: Conform to ACI 347-68, Chapter I.
- B. Allowable Tolerances: Conform to ACI 347-68, 2.4.

1.04 STORAGE OF MATERIALS

- A. Store materials on and under protective sheeting.

1.05 COORDINATION

- A. Notify responsible trades of schedules of concrete pours to allow time for installation and coordination.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Forms
 1. Flatwork: Nominal 2" thick No. 2 Common Southern Yellow Pine or steel forms.
 2. Vertical and Custom Work: Exterior grade Standard Douglas Fir (or equal plywood), minimum three ply, one smooth side sufficiently thick to sustain loads, or steel forms.
- B. Form Oil: Non staining, paraffin-base oil having a specific gravity of between 0.8 and 0.9.
- C. Form ties, bolts, rods, or patented devices having tensile strength of 3000 lbs., adjustable length, free of lugs which would leave a hole larger than 5/8" diameter and having a full one-inch depth of break-back.

PART 3 EXECUTION

3.01 CONSTRUCTION AND ERECTION

- A. construct forms in accordance with ACI 347-68.
- B. Build forms to shapes, lines and dimensions of detailed members of concrete construction. Set to line and grade, brace and secure to withstand placing of concrete and maintain their shape and position.
- C. Construct forms with care to produce concrete surfaces without unsightly or objectionable form marks in exposed concrete surfaces.
- D. Thoroughly clean surfaces of form material and remove nails before reuse. Do not reuse damaged or worn forms. Coat contact surfaces of forms with non-staining form oil prior to placing metal reinforcement.
- E. Immediately before placing concrete, clean forms of chips, sawdust, and debris. Immediately after removal of forms, remove form ties, wires, and defects and patch.

3.02 INSERTS AND ACCESSORIES

- A. Make provisions for required installation of accessories, bolts, hangers, sleeves, anchor slots and inserts cast in concrete. Obtain suitable templates or instructions for installation of items. Place expansion joints where detailed and required.

3.03 REMOVAL OF FORMS AND SHORING

- A. Remove forms and shores in accordance with ACI 347-68.

3.04 CLEANUP

- A. Remove debris and trash.

END OF SECTION 03 10 00

**SECTION 03 20 00
CONCRETE REINFORCEMENT**

PART 1 GENERAL

1.01 DESCRIPTION

- A. Furnish materials, labor, transportation, services, and equipment necessary to install all concrete reinforcement related to the skate park as indicated on scope of work contract and shown on drawings and as specified herein.
- B. Provide all steel reinforcement for construction of concrete paving for the skate park.

1.02 RELATED INFORMATION

- A. Section 03 10 00 - Concrete Forming and Accessories
- B. Section 03 30 00 - Cast-in-Place Concrete
- C. Section 03 36 00 - Shotcrete

1.03 REFERENCE STANDARDS

- A. American Concrete Institute (ACI)
 - 1. ACI 315-80, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
 - 2. ACI 318-77, Building Code Requirements for Reinforced Concrete.
- B. American Society for Testing and Materials (ASTM - latest editions)
 - 1. ASTM A233, Mild Steel Arc Welding Electrodes.
 - 2. ASTM A615, Deformed Billet-Steel Bars for Concrete Reinforcement.
 - 3. A706, Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
- C. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice, latest edition.
- D. American Welding Society (AWS): Reinforcing Steel Welding Code, D12.1-75, including latest revisions.

1.04 DELIVERY AND STORAGE

- A. Stack reinforcing steel in tiers. Mark each length, size, shape, and location.
Maintain reinforcement free of dirt, mud, paint, or rust.

1.05 SUBMITTALS

- A. Shop Drawings
 - 1. Indicate complete reinforcing method for each concrete member including materials, sizes, bends, dimensions, stirrup spacing, and placing details not shown on drawings.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Reinforcement: Deformed billet steel, ASTM A615, Grade 60. Minimum 75% Recycled Product.
- B. Welded Steel Reinforcement: Deformed low-alloy steel, ASTM A706, carbon content not exceeding 0.30% and manganese content not exceeding 0.60%. Identify and tag with manufacturer's heat identification number.

2.02 FABRICATION

- A. Fabricate to sizes, shapes, and lengths detailed in accordance with requirements of ACI 318-71 and ACI 315-65.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice and other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover over reinforcement.
- D. Accurately place reinforcing steel in accordance with drawings. Rebar shall be 2" beneath concrete surfaces. Thoroughly clean reinforcement of any coating which would reduce bonding. Do not heat, cut, or bend bars without Owner's approval. Do not splice reinforcement at points of maximum stress. Stagger splices in adjacent bars and provide a minimum overlap of 30-bar diameters at splices unless specifically noted otherwise on Drawings.
- E. Securely saddle tie intersections with No. 18-gauge black annealed wire. Rigidly secure reinforcement in place. Provide concrete coverage as shown on Drawings.

3.02 WELDING REINFORCEMENT

- A. Weld deformed steel reinforcement bars in strict accordance with AWS 12.1, using recommended pre-heat temperature and electrode for type of steel being welded.
- B. Do not weld steel reinforcement bars without proper heat identification of bars.

3.03 CLEANUP

- A. Remove debris and trash resulting from specified work.

END OF SECTION 03 20 00

**SECTION 03 30 00
CAST IN PLACE CONCRETE**

PART 1 GENERAL

1.01 DESCRIPTION

- A. Furnish materials, labor, transportation, services, and equipment necessary to install all Cast-In-Place Concrete related to the skate park as indicated on scope of work contract and shown on drawings and as specified herein.

1.02 RELATED INFORMATION

- A. Section 03 10 00 - Concrete Forming and Accessories
- B. Section 03 20 00 - Concrete Reinforcing
- C. Section 03 36 00 - Shotcrete
- D. Section 03 33 51 - Concrete Finishing
- E. Section 03 37 00 - Concrete Curing

1.03 REFERENCE STANDARDS

- A. American Concrete Institute (ACI)
 - 1. ACI 315-80, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
 - 2. ACI 318-77, Building Code Requirements for Reinforced Concrete.
- B. American Society for Testing and Materials (ASTM - latest editions)
 - 1. ASTM A233, Mild Steel Arc Welding Electrodes.
 - 2. ASTM A615, Deformed Billet-Steel Bars for Concrete Reinforcement.
 - 3. ASTM A706, Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
- C. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice, latest edition.
- D. American Welding Society (AWS): Reinforcing Steel Welding Code, D12.1-75, including latest revisions.

1.04 SUBMITTALS

- A. Design of Concrete Mixes
 - 1. Contractor shall be responsible for and pay for design of concrete mixes. Design of concrete mixes shall be performed by a Testing Laboratory selected by Contractor and reviewed and approved by the Resident Engineer / Skate Park Designer. Design methods to be in accordance with ACI 318-71.
 - 2. Concrete mix plant to conduct advance tests of trial mixes with proposed materials. Test four (4) cylinders in accordance with ASTM C39 at seven (7) days and twenty-eight (28) days. Do not place concrete on project until laboratory reports and breaks of confirmations cylinders indicate that the proposed mixes will meet the strength requirements.
 - 3. Check mix design and revise, if necessary, wherever changes are made in aggregate or in surface water content of aggregate or workability of concrete. Slump shall be the minimum to produce workable mix. Laboratory shall prescribe minimum quantity of water.
 - 4. If Portland Cement reducers or other additives are used, submit control mix design without reducers or additives as well as mix exactly proposed to be used. Submit W.R. Grace Co. recommendations for retarder and shrinkage compensation of slab on grade.
 - 5. Forward two (2) copies of design mix to the City.
- B. Submit product data and manufacturer's instructions for:
 - 1. Color admixture.
 - 2. Expansion joint fill material.
 - 3. Curing compound.
 - 4. Dowel aligners/caps.

5. Crack repair materials.
 6. Form facing materials.
 7. Proprietary cleaning agents.
 8. Plastic film for curing.
 9. Surface retarders.
 10. Micro-Fiber reinforcement
- C. Samples
1. Samples for Color Selection: Submit color additive manufacturer's color chart & sample chip set; indicate color additive number and required dosage rate. Samples indicate general color and may vary from concrete finished in field according to Specifications.
 2. Joint Fill Materials: Submit data sheets for Sika 1A and Sika 1C-SL.
- D. Placement / Pour Schedule
1. Contractor to indicate on plans the locations to be installed within a day's work and not exceeding 50 cubic yards per day for quality control and inspection schedules.
 2. Schedule and sequence to be reviewed and approved by the Resident Engineer / Skate Park Designer prior to starting this work.
- E. Cast in Place Concrete Samples / Mock-Ups
1. Contractor shall prepare 4'x 4' samples for each cast-in-place concrete type indicated on Drawings. Contractor may pour each type as part of the finished project, and if approved by the Resident Engineer / Skate Park Designer it may remain in place as finished product. If the sample is not approved, the Contractor in charge of the specific scope of work shall remove and replace another sample for Resident Engineer / Skate Park Designer's approval at no additional cost to the City.
 2. Samples shall be completed to the satisfaction of the Resident Engineer / Skate Park Designer including aggregates, texture, color, and finishes. If samples are rejected by the Resident Engineer / Skate Park Designer, the Contractor in charge of the specific scope of work shall remove and replace the sample for the Resident Engineer / Skate Park Designer's approval at no additional cost to the City.
 3. These samples will become the standard of quality by which future paving samples and work will be judged.
 4. Samples to remain on-site and be protected during construction, to compare work in progress. If samples are damaged or removed, the Contractor in charge of the specific scope of work shall repair/replace in-kind immediately at no additional cost to the City.
- F. Test Reports: Compressive strength of concrete test cylinders taken upon delivery of concrete.

1.05 QUALITY ASSURANCE

- A. Concrete Testing
1. Prepare samples by each application crew using the equipment, materials and mix proportions proposed for the Project. City shall observe preparation of test panels noting placement of cast in place concrete by applications crew.
 2. Test panel shall be minimum 6" x 18" x 18" maximum 6" x 24" x 24". Test panel shall conform to Part 1.04 Submittals.
 3. Secure and protect samples during construction and test for compliance with Specifications.
 4. Test strength of the cast in place concrete as work progresses as follows:
 - a. Cut cores from the test panel and test in accordance with ASTM C42.
 - b. One test panel per 50 yards of accumulated cast in place concrete, minimum 6" x 18" x 18" maximum 6" x 24" x 24". Cores taken from the test panel shall be taken not less than once each shift nor less than one for each 50 cubic yards of cast in place concrete placed through the nozzle.
 - c. Cores shall be soaked in water for a minimum of forty (40) hours before testing.
- B. Certification

1. Nozzleman certification shall be in accordance with ACI 506.3R.
- C. Regulatory Requirements
 1. Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over Work
- D. Acceptance
 1. Final acceptance of the cast in place will be done by the Resident Engineer / Skate Park Designer and will be based upon the results obtained from cores.
- E. Concrete Manufacturer Qualifications
 1. Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- F. Skate Park Contractor / Sub-Contractor Experience

Provide evidence to indicate successful experience in providing cast in place concrete work for skate parks similar in scope to that specified herein and can demonstrate successful experience through past project documentation and references.

1. Required Experience

Skate Park Contractor or Sub-Contractor must have completed three (3) public concrete skate park facilities with a minimum size of 10,000 square feet, in the last five (5) years. Parks must be open and in good operating condition for at least one (1) year.

2. Evidence of Experience

Skate Park Contractor or Sub-Contractor shall submit to Field Engineer Inspector satisfactory documentation of previously mentioned experience and qualification. If a Contractor cannot provide this information or if it is unverifiable, work under this Section and any other related Section cannot be completed by Contractor. This submission must contain the Project Name & Location, City Name & Contact Information, Designer Name & Contact Information, Project Size, Contract Value, Completion Date, and Supervisor and/or Key Personnel responsible for this experience for each of the qualifying projects.

3. Safety and Performance Guidelines

Comply with all safety and performance requirements and all applicable references as specified in the ASTM F2480 Standard Guide for In-ground Skate Parks.

4. ACI Requirements

Meet all requirements of ACI 6. ~ ACI 318-77 – Building Code Requirements for Reinforced Concrete.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store materials in dry and protected locations and protect from damage.
- B. Do not change brand of cement or source of aggregate during course of Work, without prior approval from the Resident Engineer / Skate Park Designer.

1.07 SITE CONDITIONS

- A. Environmental Requirements:
 1. Contractor shall submit plan to monitor wind velocity, relative humidity, temperature, and concrete temperature to maintain specified maximum rate of evaporation.
 2. Do not place concrete when sub-base surface temperature is less than 40 degrees F, nor when surface is wet.
 3. Protect concrete against extreme cold and heat, frost, rapid drying, and damage by rain.

- B. Coordination:
1. Coordinate schedules of concrete placement to allow adequate time for installation of other related work.
 2. Verify that anchor bolts and other embedded steel items to be cast into concrete are properly placed.
 3. Coordinate size and location of mechanical and electrical equipment concrete pads.
 4. Coordinate earthwork and Soils Report requirements with placement requirements.
 5. Coordinate with formwork and finishes sections to provide finish floor levelness and flatness as specified herein. Slope to drains at grades and percent slope shown on contract documents.
 6. Ensure that irrigation sleeves, electrical conduit, drainage lines and other utility elements are accommodated and as-built located prior to placing concrete.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Ready Mixed Concrete: Batched, mixed, and transported in accordance with ASTM C94 – Specifications for Ready Mixed Concrete.
- B. Portland Cement: Refer to Drawings for specific paving type and finish required and conform to ASTM C-150, Type II. Use same brand of cement from single source throughout entire project for each paving type unless approval from the Resident Engineer / Skate Park Designer states otherwise.
- C. Fine Aggregate (washed concrete sand): Clean, hard, durable, uncoated washed natural sand, free from silt, loam, or clay, and conforming to ASTM C33.
- D. Coarse Aggregate: Class II-Hard durable, un-coated crushed limestone meeting requirements of ASTM C-33. Unless otherwise noted in aggregate size 1" minimum, No., 56 or 57. Base rock shall conform to local code.
- E. Water: Potable and free from deleterious materials such as oils, acids, and organic matter.
- F. Admixture: Cement-dispersing, water-reducing compound, ASTM C 494, Type A, as made by Master Builders, Sika, or Gifford-Hill Co., or equal. Depending upon weather conditions at time of placing, ASTM C 494, Type D (water-retarding) or Type E (water-reducing, accelerating) may be used if approved by the Resident Engineer / Skate Park Designer.
- G. Additives: Micro-Fiber reinforcement that is designed to mitigate plastic shrinkage cracking, to be approved by the Resident Engineer / Skate Park Designer, in all concrete (dosage as recommended by the manufacturer).
- H. Curing Materials:
1. Water: Domestic Quality, clear and potable with no chemical content.
 2. Sheet Material: Comply with ASTM C171. Moisture loss maximum .055 g/cm sq. Color: White.
 3. Curing Compounds/Sealer: Curing compound shall comply with ASTM C309 and be approved by color additive manufacturer for use with colored concrete

2.02 PROPORTIONS AND MIXING

- A. Proportions and Design: In accordance with approved mix design. Minimum allowable compressive strength at 28 days is 4000 psi (as marked per plan).
- B. Admixture: No admixtures without approval of the Resident Engineer / Skate Park Designer. Introduce admixtures in quantities and according to methods recommended by admixture manufacturer. Add air-entraining agent to concrete as scheduled.
- C. Slump: Not to exceed 4"

- D. Mixing: Ready mixed concrete in accordance with ASTM C-94. Do not transport or use concrete after 1-1/2 hours have elapsed from time of initial mixing. Supplier of transit-mixed concrete shall have a plant of sufficient capacity, and adequate transportation facilities to assure continuous delivery at required rate, to provide continuous concrete placement throughout a pour.
- E. Grout and Dry Pack: Non-Shrink, Non-Metallic: U.S. Grout Corp or equal. "Five Star Grout" ASTM C- 827, C-1107-02 Grades A, B and C, and C-1107-07, 5,000 PSI.

2.03 CURING MATERIALS

- A. Water: Domestic Quality, clear and potable with no chemical content.
- B. Sheet Material: ASTM C171. Moisture loss maximum .055 g/ cm sq. Color: White.
- C. Curing Compounds: Ashford Formula™ Curecrete by Curecrete Distribution, Inc., Phone (800) 998-5664, or equal.

PART 3 EXECUTION

3.01 INSPECTION

- A. Inspect subgrade, forms, reinforcing steel, pipes, conduits, sleeves, hangers, anchors, inserts, and other work required to be built into concrete and report any discrepancies. Notify City at least five (5) working days in advance of scheduled placement.
- B. Correct unsatisfactory work prior to placing concrete.
- C. Remove rubbish from formwork immediately prior to placing concrete.

3.02 INSTALLATION

- A. Placing Concrete:
 - 1. Convey and place concrete allowing no separation of ingredients in accordance with ACI 304 and as specified below.
 - 2. Maximum height of concrete free fall – five (5) feet.
 - 3. Regulate rate of placement to maintain plasticity and flow into position.
 - 4. Deposit concrete continuously until panel or section is completed.
 - 5. Place concrete in horizontal layers 18" maximum thickness.
- B. Consolidation:
 - 1. Use mechanical vibrating equipment for consolidation.
 - 2. Vertically insert and remove hand-held vibrators at 18" O.C. for 10 to 15 seconds.
 - 3. Do not use vibrators to transport concrete in forms.
 - 4. Provide vibrators with minimum speed of 8000 RPM and with amplitude to consolidate effectively.
 - 5. Thoroughly consolidate concrete and work around reinforcement, embedded items and into corners of forms. Thoroughly consolidate layers of concrete with previous layers.
- C. Construction Joints:
 - 1. Unless otherwise shown on Drawings, each footing, wall, beam, and slab shall be considered as a single unit of operation and shall be monolithic in construction.
 - 2. Where construction joints are unavoidable, locate joints at or near quarter points of spans where approved by Resident Engineer / Skate Park Designer and/or shown on plan.
 - 3. Saw Cut joints, Expansion Joints and Cold Joints as detailed in contract documents.
- D. Expansion Joint Fillers:
 - 1. Refer to Drawings for Expansion Joint locations and details.
 - 2. Finish joint material flush with concrete surface.

- E. Hot Weather Placement:
 - 1. Prevent high temperature in fresh concrete during hot weather in accordance with ACI 305.
 - 2. Use water reducing set retarding admixtures in such quantities as especially recommended by manufacturer to assure that concrete remains workable and lift lines will not be visible.
- F. Flatwork:
 - 1. Cast slabs-on-grade in alternate sections unless permanent forms are used. Wait 48 hours between all adjacent concrete castings.
 - 2. Plane Surface Tolerance: Exterior- Class AX, 3/16" in 10' with no ponding.
 - 3. Maximum 1:500 slope from indicated plane at any point.
- G. Finish:
 - 1. Smooth Trowel finish to match approved Mock-Up finish. If the finish is not approved, the Contractor in charge of the specific scope of work shall remove and replace another sample for Resident Engineer / Skate Park Designer's approval.
 - 2. After surface water disappears and floated surfaces have sufficiently hardened, steel trowel then re-trowel the surface to a smooth and consistent finish.
 - 3. After concrete has set enough to provide edge troweling, re-trowel edges to a smooth and uniform finish.
- H. Cracking:
 - 1. Cracking from inadequate curing is not allowed. Sawcut joints and construction joints are shown on drawings. Contractor may, with review and approval by the Resident Engineer / Skate Park Designer, recommend and detail other joints required to prevent cracking.

3.03 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, defective, or does not meet the requirements of this Section or conformance with ASTM F 2480 - Standard Guide for In-ground Skate Parks.
- B. Protect concrete from damage; exclude traffic from paving for at least 28 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain concrete paving free of stains, discoloration, dirt, wax, and other foreign material.

3.04 TOLERANCES

- A. Minor variations in appearance of colored concrete, which are like natural variations in color and appearance of uncolored concrete, are acceptable but subject to approval by the Resident Engineer / Skate Park Designer.

3.05 REJECTIONS

- A. Major variations in the appearance of integral colored concrete compared to manufacturer's sample chip shall be rejected by the Resident Engineer / Skate Park Designer. The Contractor in charge of the specific scope of work shall remove and replace rejected work for the Resident Engineer / Skate Park Designer's approval at no additional cost to the City.
- B. Defects in the concrete including lack of uniformity, exhibits segregation honeycombing, or lamination, or which contains any dry patches, slugs, voids, or pockets shall be rejected by the Resident Engineer / Skate Park Designer. The Contractor in charge of the specific scope of work shall remove and replace rejected work for the Resident Engineer / Skate Park Designer's approval at no additional cost to the City.
- C. Radial wall finishes shall consist of smooth, hard, uniform surface of smooth trowel with a level tolerance of 1/8 inch in 10 feet when tested with a 10-foot steel straightedge placed on the surface horizontally and vertically. Grinding the surfaces will not be an acceptable means of achieving the intended radii and uniformity shall be approved by the Resident Engineer / Skate

Park Designer. If rejected, The Contractor in charge of the specific scope of work shall remove and replace rejected work for the Resident Engineer / Skate Park Designer's approval at no additional cost to the Owner.

3.06 CLEAN UP

- A. At completion of Work, remove concrete stains from adjacent work, including but not limited to dissimilar paving types, walls, columns, railing posts, light fixtures, plant materials, to satisfaction of the Resident Engineer / Skate Park Designer.

END OF SECTION 03 30 00

**SECTION 03 33 51
CONCRETE FINISHING**

PART 1 GENERAL

1.01 SPECIALTY SKATE PARK CONSTRUCTION

- A. All work contained in this Section is considered Specialty Skate Park Construction. Only those Contractors that meet the minimum experience requirements contained in the Quality Assurance Section of this specification may perform this work as specified herein.

1.02 REGULATIONS

- A. The work shall conform to requirements of the American Concrete Institute (ACI) and the local Building Code for concrete finishing, as supplemented and modified on drawings or herein.

1.03 REFERENCE STANDARDS

- A. The Concrete Finishing shall conform to the requirements of the following Reference Standards or as modified and supplemented hereinafter.
1. American Concrete Institute (ACI) Specifications for Structural Concrete for Buildings, ACI 301
 2. ACI Recommended Practice for Cold Weather Concreting, ACI 306
 3. ACI Recommended Practice for Hot Weather Concreting, ACI 605

1.04 RELATED SECTIONS

- A. Section 03 10 00 - Concrete Formwork
B. Section 03 20 00 - Concrete Reinforcement
C. Section 03 30 00 - Cast in Place Concrete
D. Section 03 36 00 - Shotcrete

1.05 QUALITY ASSURANCE

- A. Skate Parks are not considered standard concrete flatwork. Where indicated to be exposed, Skate Park concrete is architecturally finished concrete represented in the form of complex and unique shapes. Typical Skate Park features will incorporate concave and convex transitioning between surfaces which require the specified finishes to sculpturally blend along compound radius curves. It is critical that Skate Park concrete work be completed with a high level of precision for the skate facility to function properly and safely. Special care must be taken to provide the specified finished surfaces without gravel pockets, and other defects/defacements. The Resident Engineer / Skate Park Designer shall inspect concrete after removal of forms and before concrete repair work begins. Concrete that does not meet the minimum requirements of the specifications shall be rejected by the Resident Engineer / Skate Park Designer and therefore removed and replaced in its entirety by the Contractor at their expense.

1.06 CONTRACTOR QUALIFICATION STATEMENT / SUBMITTAL

- A. To be considered a qualified and responsible Bidder, the Bidder shall provide documentation establishing that the Bidder and/or subcontractor has satisfied the experience requirements listed below:
1. The Skate Park specialty contractor, or subcontractor must provide proof of three (3) public concrete skate park facilities with a minimum size of 10,000 square feet, in the last five (5) years. Parks must be open and in good operating condition for at least one (1) year.
 2. Installation of storm drainage systems in conjunction with Skate Park components.
 3. Shaping of earthwork to specified radius.

4. Experience creating the following in facilities specifically intended for skateboarding: Cast in place concave and convex shaped concrete elements containing compound radius curves that must be precisely shaped to function as intended.
5. Experience in application of vertical and horizontal shotcrete work, including horizontal and vertical radius transitions that include compound radius curves and blends, formed concrete, grinding rails, and associated concrete reinforcement as needed.
6. The Contractor shall be skilled with the installation of steel coping edges, smooth flowing seamless transition areas, and smooth trowel concrete finish work.
7. Layout, fabrication, and construction of the steel coping.
8. Installation of concrete flatwork between bowled areas.

1.07 PROTECTION

- A. Protect persons and adjacent materials and finishes from dust, dirt and other surface or physical damage during finishing operations, including materials driven by wind.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION

3.01 REPAIRS

- A. Immediately after the removal of forms inspect all surfaces for defects. Repair or patch defects only after defects are inspected by the Resident Engineer / Skate Park Designer and then only with the Resident Engineer / Skate Park Designer's permission. Do all cutting and repair within 48 hours after removal of forms; cure repairs same as new concrete.

3.02 FINISHES FOR FORMED SURFACES

- A. Rough Form Finish
 1. Provide for surface of walls and footings adjacent to grade or below grade. This is the concrete surface having texture imparted by form facing material use with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth Formed Finish
 1. Provide a smooth formed finish on formed concrete surfaces exposed to view. This is an as-cast concrete surface obtained with selected form facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Remove fins and other projections completely and smoothed. Repair and patch honeycombs and defective areas as directed by the Resident Engineer / Skate Park Designer. Tie holes shall not be filled.
- C. Sacked Finish
 1. On all inconsistent surfaces of the exposed concrete, provide a sacked finish by coating the concrete with sacking mortar. Sacking of patched or defective concrete surfaces may be required by the Resident Engineer/ Skate Park Designer for areas not otherwise already requiring this work.
 2. Repair and patch tie holes, honeycombs and defective areas and trowel to smooth finish. Remove fins and other projections completely.
 3. Thoroughly wet surface to prevent absorption.
 4. Coat the entire surface with sacking mortar as soon as surface of concrete approaches surface dryness.
 5. Thoroughly and vigorously rub mortar over area with clean burlap pads to fill all voids.
 6. While mortar is still plastic but partially set (so it cannot be pulled from voids), sack-rub surface with dry mix of sacking mortar (leave out water). There should be no discernible thickness of mortar on concrete surface, except in voids; all surfaces should be uniformly textured.
 7. Immediately begin a continuous moist cure for 72 hours.

D. Related Unformed Surfaces

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

3.03 FINISHES FOR UNFORMED SURFACES

- A. Screed all slabs, for whatever finishes, to true levels or slopes, work surfaces only to the degree required to produce the desired finish; do no finishing in areas where water has accumulated until they have been drained and excess moisture has dried. Carefully finish all joints and edges with proper tools, unless otherwise specified.
- B. Rough Screed Finish
 1. Consolidate, level, and screed all surfaces to obtain evenness and uniformity; remove all surplus concrete after consolidation by striking off with sawing motion against guide strips.
- C. Float Finish
 1. Apply float finish to monolithic slabs to receive trowel or other finishes. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using floats appropriate to the surface contours only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F(F) 18 (floor flatness) and F(L) 15 (floor levelness) measured according to ASTM E 1155. Uniformly slope surfaces to drains. Cut down high spots and fill low spots immediately after leveling, re-float surface to a uniform, smooth, granular texture.
- D. Hard Trowel Finish
 1. After floated surface is firm enough to receive steel trowels, trowel at least two complete passes, or until last stage before blackening. Leave no trowel marks discernible to the touch. Do not use excessive water, especially on last the pass.
- E. Defective Work
 1. Remove and replace when directed by the Resident Engineer/ Skate Park Designer, surfaces which show inferior finish quality.

3.04 CURING

- A. Protect concrete surfaces against rapid drying. Apply Clear Spray-on cure agent after final finish is achieved. Keep sealed with cure agent for necessary amount of time to reach concrete strength and inhibit moisture loss after placing per manufacturer's recommendation.
- B. Duration of Curing
 1. In addition to the initial overnight curing, continue final curing operations until the cumulative number of days or fractions thereof (not necessarily consecutive) occurs, during which time the temperature of the air in contact with the concrete is above 50 degrees F, equals 7 days. Curing period considered done when compressive strength is reached. If high-early strength concrete has been used, continue final curing operation for 3 days total time, calculated as before. Take care to prevent rapid drying at the end of the curing period. Early removal of forms will not be approved when forms are removed during the curing period.

3.05 INSPECTION

- A. Contractor shall notify Resident Engineer / Skate Park Designer that they are starting concrete finish repair work at least five (5) working days prior to the beginning of work.

3.06 REJECTIONS

- A. Major variations in the appearance of integral colored concrete compared to manufacturer's sample chip shall be rejected by the Resident Engineer / Skate Park Designer. The Contractor in charge of the specific scope of work shall remove and replace rejected work for the Resident Engineer / Skate Park Designer's approval at no additional cost to the Owner.
- B. Defects in the concrete including lack of uniformity, exhibits segregation honeycombing, or lamination, or which contains any dry patches, slugs, voids, pockets or does not meet the radius requirements of the design shall be rejected by the Resident Engineer / Skate Park Designer. The Contractor in charge of the specific scope of work shall remove and replace rejected work for the Resident Engineer / Skate Park Designer approval at no additional cost to the Owner.
- C. Radial wall finishes shall consist of smooth, hard, uniform surface of smooth trowel with a level tolerance of 1/8 inch in 10 feet when tested with a 10-foot steel straightedge placed on the surface horizontally and vertically. Grinding the surfaces will not be an acceptable means of achieving the intended radii and uniformity shall be approved by the Resident Engineer / Skate Park Designer. If rejected, The Contractor in charge of the specific scope of work shall remove and replace rejected work for the Resident Engineer / Skate Park Designer's approval at no additional cost to the Owner.

3.07 CLEANING

- A. Leave premises clean and free of residue from work in this section.

3.08 PROTECTION AND SITE SECURITY FROM VANDALISM

- A. It shall be the contactors responsibility to protect the site from theft and vandalism.

END OF SECTION 03 33 51

**SECTION 03 36 00
SHOTCRETE**

PART 1 GENERAL

1.01 DESCRIPTION

- A. Provide sprayed-on concrete (concrete conveyed into place by air pressure through a flexible tube or gun with controlled nozzle) referred to herein as shotcrete, complete as shown and as specified by Skate Park Contractor.
 - 1. Provide sprayed-on concrete (concrete conveyed into place by air pressure through a flexible tube or gun with controlled nozzle) referred to herein as shotcrete, complete as shown and as specified.
 - 2. Application, cutting, and sculpting and finish work related to this Work is deemed specialty work within the Contract Documents.
 - 3. All work related to this application, cutting, sculpting, and installation shall be coordinated with the Resident Engineer / Skate Park Designer, prior to project start.

1.02 RELATED INFORMATION

- A. Section 03 10 00 - Concrete Forming and Accessories
- B. Section 03 20 00 - Concrete Reinforcing
- C. Section 03 30 00 - Cast-In-Place Concrete
- D. Section 03 33 51 - Concrete Finishing
- E. Section 03 37 00 - Concrete Curing
- F. Section 05 50 00 - Metal Fabrications

1.03 REFERENCES

- A. Comply with the requirements of the current edition of the following codes and standards, except as herein modified:
 - B. Latest Uniform Standard Specifications issued by the Owner.
 - C. American Concrete Institute (ACI): 506, Chapter 13, Wet Method. Chapter 5, Shotcrete Crew.
 - D. American Society for Testing Materials (ASTM)

1.04 SUBMITTALS

- A. Submit current product data and manufacturer's instructions for proprietary materials including:
 - 1. Color admixture
 - 2. Expansion joint fill material
 - 3. Curing compound
 - 4. Dowel aligners / caps
 - 5. Form facing materials
 - 6. Form release agents
 - 7. Proprietary cleaning agents
 - 8. Plastic film for curing
 - 9. Surface retarders
 - 10. Micro-Fiber reinforcement
- B. Shop Drawings
 - 1. Section and plan views showing all proposed construction joints.
 - 2. Contractor to submit shop drawings for all templates to be used on the project.
- C. Design of Concrete Mixes

1. Contractor shall be responsible for and pay for design of concrete mixes for each type of concrete specified. Design of concrete mixes shall be performed by a Testing Laboratory selected by Contractor and approved by the Resident Engineer / Skate Park Designer. Design methods to be in accordance with ACI 318.
 2. Make three (3) trial mixes using aggregate proposed.
 3. Check mix design and revise, if necessary, wherever changes are made in aggregate or in surface water content of aggregate or workability of concrete. Slump shall be the minimum to produce workable mix. Laboratory shall prescribe minimum quantity of water.
 4. Forward two copies of design mix to the Owner and Resident Engineer / Skate Park Designer for approval.
- D. Placement / Pour Schedule
1. Contractor to indicate on plans the locations to be shot within a day's work and not exceeding 50 cubic yards per day for quality control and inspection schedules.
 2. Schedule and sequence to be reviewed and approved by the Resident Engineer / Skate Park Designer prior to starting this work.
- E. Shotcrete Samples / Mock-Ups
1. Provide representative samples of materials for material testing, mix proportion testing, and finish.
 2. Sample of each of the following must be provided: Bowl section with 2" round steel coping and a standard bank with radius transition bottom. The shotcrete samples need to match the same height, radius, angle, curvature, finish, and reinforcement of the corresponding sections and details for inspection and approval. The sample may be part of the finished product and can remain in place as finished product if approved by the Resident Engineer / Skate Park Designer. If the sample is built in place it needs to follow the jointing outlined in the Concrete Jointing plan. If the samples are built elsewhere on-site, they only need to be six feet (6') wide with height and length corresponding to the sections.
 3. Contractor shall prepare and pay for a sample for each paving type indicated on Drawings prior to installation.
 4. Samples shall be completed to the satisfaction of the Resident Engineer / Skate Park Designer and shall include aggregates, texture, color, and finishes. If samples are rejected by the Resident Engineer / Skate Park Designer, the Contractor in charge of the specific scope of work shall remove and replace the sample for the Resident Engineer / Skate Park Designer's approval at no additional cost to the Owner.
 5. These samples will become the standard of quality by which future paving samples and work will be judged.
 6. Samples to remain on-site and be protected during construction, to compare work in progress. If samples are damaged or removed, Contractor shall repair / replace in-kind immediately at no additional cost to the Owner.
- F. Test Reports: Compressive strength of concrete test cylinders taken upon delivery of concrete.

1.05 QUALITY ASSURANCE

- A. Concrete Testing
1. Prepare samples by each application crew using the equipment, materials and mix proportions proposed for the Project. Resident Engineer / Skate Park Designer shall observe preparation of test panels noting placement of shotcrete by applications crew.
 2. Test panel shall be at least 6" x 18" x 18". Test panel shall conform to Section 03 36 00 Shotcrete, Part 1.04 Submittals.
 3. Secure and protect samples during construction and test for compliance with Specifications.
 4. Test strength of the shotcrete as work progresses as follows:
 - a. Cut cores from the test panel and test in accordance with ASTM C42.

- b. One 6" x 18" x 18" test panel every 50 cubic yards of accumulated shotcrete. A set of four 43) 2' x 2' x 6" cores taken from the test panel shall be taken and broken on days 7, 14, 21 and 28. shotcrete placed through the nozzle.
 - c. Cores shall be soaked in water for a minimum of 40 hours before testing.
- B. Certification
1. Nozzleman certification shall be in accordance with ACI 506.3R.
- C. Regulatory Requirements
1. Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over Work
- D. Acceptance
1. Final acceptance of the shotcrete will be done by the Resident Engineer / Skate Park Designer and will be based upon the results obtained from cores.
- E. Concrete Manufacturer Qualifications
1. Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- F. Skate Park Contractor / Sub-Contractor Experience
1. Provide evidence to indicate successful experience in performing shotcrete concrete work for skate parks similar in scope to that specified herein and can demonstrate successful experience through past project documentation and references.
 - a. Required Experience

Skate Park Contractor or Sub-contractor must have completed three (3) public concrete skate park facilities with a minimum size of 10,000 square feet, in the last five (5) years. Parks must be open and in good operating condition for at least one (1) year.

- b. Evidence of Experience

Skate Park Contractor or Sub-contractor shall submit to Field Engineer Inspector satisfactory documentation of the experience and qualification. If a Contractor cannot provide this information or if it is unverifiable, work under this Section and any other related Section cannot be completed by Contractor. This submission must contain the Project Name & Location, Owner's Name & Contact Information, Designer Name & Contact Information, Project Size, Contract Value, Completion Date, and Supervisor and/or Key Personnel responsible for this experience for each of the qualifying projects.

- c. Safety and Performance Guidelines

Comply with all safety and performance requirements and all applicable references as specified in the ASTM F2480 Standard Guide for In-ground Skate Parks.

- d. ACI Requirements

Meet all requirements of ACI 506, Chapter 13, Wet Method and Chapter 5, Shotcrete Crew.

1.06 DELIVERY, HANDLING, AND STORAGE

- A. Properly deliver and handle materials to prevent contamination, segregation, or damage to materials.
- B. Store cement in weather tight enclosures to protect against dampness and contamination.

- C. Prevent segregation and contamination of aggregates by proper arrangement and use of stockpiles.
- D. Store admixtures properly to prevent contamination, evaporation, or other damage.
- E. Do not change brand of cement or source of aggregate during course of Work.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type I or II, one brand only.
- B. Fly Ash: ASTM C618, Class C only. The amount of fly ash used shall not exceed 20% by weight of the combined weight of fly ash and cement.
- C. Normal Weight Aggregates: ASTM C33 and as herein specified.
 - 1. Batch fine coarse aggregates separately to avoid segregation.
 - 2. Aggregates shall be free from clay, mud, loam, or other deleterious substances.
 - 3. Dune sand, bank run sand, and manufactured sand are not acceptable for fine aggregate.
 - 4. Coarse aggregate shall be clean, uncoated, heavy media processed aggregate of crushed stone or river washed aggregate.

2.02 ACCESSORIES

- A. Water: Fresh, clean, potable, and free of deleterious acids, mixing, and curing water, as available from Owner. Transport as required.
- B. Admixtures: Use only accepted admixtures meeting the following requirements:
 - 1. Chemical Admixtures: ASTM C494
 - 2. Air-entraining Admixtures: ASTM C260
- C. Expansion Joints: See Cast-In-Place Concrete - Section 03 30 00.
- D. Additive: Micro-Fiber reinforcement that is designed to mitigate plastic shrinkage cracking, to be approved by the Resident Engineer / Skate Park Designer, in all concrete (dosage as recommended by the manufacturer).

2.03 PROPORTIONING AND DESIGN OF CONCRETE MIXES

- A. Mix
 - 1. Prepare design mix to achieve an in-place 28-day compressive strength of 4,000 pounds per square inch and an air content as specified on plans. Maximum aggregate size shall not exceed 3/8 inch. Unit weight of in-place shotcrete shall be 494 pounds per cubic yard. Contractor to pay for and use an independent Testing Agency acceptable to the Resident Engineer / Skate Park Designer to prepare and report the proposed mix design. Testing is at the cost of the Contractor responsible for this mix.
- B. Test Data
 - 1. Submit for acceptance proportioning and test data from prior experience if available. If data from prior experience are not available or accepted, make, and have tested specimens from three or more different mix proportions in accordance with pre-construction testing requirements of this Specification.
- C. Strength
 - 1. Selected mix proportions based on compressive strength tests of specimens shall be cut from the shotcrete test panels not earlier than five (5) days after shotcreting. For mix acceptance purposes, average core strengths shall be least equal to f'_c for cores with L/D of 2.0. For cores with L/D between 1.0 and 2.0, use correction factors given in ASTM C42.
- D. Review
 - 1. Mix design shall be reviewed for acceptance by Resident Engineer / Skate Park Designer.

2.04 CONCRETE APPLICATION EQUIPMENT

- A. For Wet Mix Shotcrete
 - 1. Mixing Equipment: Capable of thoroughly mixing aggregate, cement, and water in sufficient quantity to maintain continuous placement.
 - 2. Ready-mixed Concrete: ASTM C94, except that it may be delivered to the site in the dry state if the equipment can add the water and mixing it satisfactorily with the dry ingredients.
 - 3. Air Supply: Clean air adequate for maintaining sufficient nozzle velocity for parts of work, and for simultaneous operation of blow pipe for cleaning away rebound.
 - 4. Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously through delivery hose.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examination
 - 1. Examine concrete formwork and verify that it is true to line and dimension, adequately braced against vibration, and constructed to permit escape of air and rebound but to prevent mortar leakage during shotcreting. Correct deficiencies.
- B. Inspection
 - 1. Inspect reinforcement steel and items to be embedded in concrete. Correct any deviations from the accepted shop drawings.
- C. Notification
 - 1. Notify other trades involved in ample time to permit the proper installation of their work. Cooperate in setting such work.
- D. Existing Surfaces
 - 1. Examine existing concrete surfaces for unsound material. Correct deficiencies.

3.02 PREPARATION FOR INSTALLATION OF CONCRETE

- A. Forms
 - 1. Use a form-coating material on removable forms to prevent absorption of moisture and to prevent absorption of moisture and to prevent bond with shotcrete.

3.03 CONCRETE BATCHING AND MIXING

- A. Proportions
 - 1. Mix proportions shall be controlled by weight batching. Contractor's Testing Laboratory shall maintain quality control records during shotcrete production and make those records available to the Resident Engineer / Skate Park Designer.

3.04 CONCRETE PLACEMENT

- A. Placement
 - 1. Use suitable delivery equipment and procedures that will result in shotcrete in place meeting the requirements of this Specification. Determine operating procedures for placement in, extended distances, and around any obstructions where placement velocities and mix consistency must be adjusted.
- B. Placement Techniques
 - 1. Do not place shotcrete if drying or stiffening of the mix takes place at any time prior to delivery to the nozzle.
 - a. Control thickness, method of support, air pressure, and/or water content of shotcrete to preclude sagging or sloughing off. Discontinue shotcreting or provide suitable means to screen the nozzle stream if wind or air currents cause separation of the nozzle stream during placement.
 - b. Hold nozzle as perpendicular to surface as work will permit, to secure maximum compaction with minimum rebound.

- c. In shotcreting walls, begin application at bottom. Ensure work does not sag.
- d. Layering
 - 1) Build up layers by making several passes of nozzle over work area.
 - 2) Broom or scarify the surface of freshly placed shotcrete to which, after hardening, additional layers of shotcrete are to be bonded. Dampen surface just prior to application of succeeding layers.
 - 3) Allow each layer of shotcrete to take initial set before applying succeeding layers.
 - 4) Use radial templates to insure exact radii from flat bottom of skate park deck and coping. Template shall be fabricated from steel or $\frac{3}{4}$ " plywood. Check every horizontal foot when applying shotcrete for conformance of intended wall radii. Brace template and place levels at arc to tangent connections to ensure no kinks will be formed. Kinks at the bottom of bowls will not be acceptable. Slumping of the shotcrete causing coping setback will not be acceptable.
- e. Placement around Reinforcement
 - 1) Hold the nozzle at such distance and angle to place materials behind reinforcement before any material can accumulate on its face. In the dry-mix process, additional water may be added to the mix when encasing reinforcement to facilitate a smooth flow of material behind the bars.
 - 2) Test to ascertain if any void or sand pockets have developed around or behind reinforcement by probing with an awl or other pointed tool after the shotcrete has achieved its initial set, by removal of randomly selected bars, or coring or other suitable standards.

3.05 REMOVAL OF SURFACE DEFECTS IN CONCRETE

A. General

- 1. Remove and replace shotcrete which lacks uniformity, exhibits segregation, honeycombing, or lamination, or which contains any dry patches, slugs, voids, or pockets. Remove defective areas.

a. Sounding

- 1) Sound work with hammer for voids. Remove and replace damaged in-place shotcrete.

3.06 CONCRETE FINISH

A. Form Finish

- 1. Smooth form finish shall consist of a smooth, hard, uniform texture with a minimum of seams.

B. Unformed Finish / Radial Wall Finish

- 1. Float finish on unformed face of wall shall consist of a smooth, hard, uniform surface of smooth steel trowel. Level to a tolerance of 1/10 inch in 10 feet when tested with a 10-foot steel straightedge placed on the surface horizontally, and vertically with radial template with the appropriate radii. Grinding the surfaces will not be an acceptable means of achieving the intended radii. Concrete finish work shall match the approved sample poured on site.

3.07 CONCRETE JOINTS

A. Cleaning

- B. The entire joint shall be thoroughly cleaned and wetted prior to the application of additional shotcrete.

C. Reinforcement

- D. Make joints perpendicular to the main reinforcement. Continue reinforcement across joints.

3.08 CONCRETE CURING AND PROTECTION

- A. Initial Curing
 - 1. Immediately after finishing, keep shotcrete continuously moist for at least 24 hours. Use one of the following materials or methods:
 - a. Ponding or continuous sprinkling.
 - b. Cover and keep continuously wet.
- B. Final Curing
 - 1. Provide additional curing immediately following the initial curing and before the shotcrete has dried. Use one of the following materials or methods:
 - a. Continue the method used in initial curing.
 - b. Materials conforming to Specifications for Sheet Materials for Curing Concrete, ASTM C 171.
- C. Duration of Curing
 - 1. Continue for the first 7 days after shotcreting or until specified strength is obtained. During the curing period, maintain shotcrete above 40 degrees and in a moist condition. Prevent rapid drying at the end of the curing period.

3.09 REJECTIONS

- A. Major variations in the appearance of integral colored concrete compared to manufacturer's sample chip shall be rejected by the Resident Engineer / Skate Park Designer. The Contractor in charge of the specific scope of work shall remove and replace rejected work for the Resident Engineer / Skate Park Designer's approval at no additional cost to the Owner.
- B. Defects in the shotcrete including lack of uniformity, exhibits segregation honeycombing, or lamination, or which contains any dry patches, slugs, voids, or pockets shall be rejected by the Resident Engineer / Skate Park Designer. The Contractor in charge of the specific scope of work shall remove and replace rejected work for the Resident Engineer / Skate Park Designer's approval at no additional cost to the Owner .
- C. Radial wall finishes shall consist of smooth, hard, uniform surface of smooth trowel with a level tolerance of 1/8 inch in 10 feet when tested with a 10-foot steel straightedge placed on the surface horizontally and vertically. Grinding the surfaces will not be an acceptable means of achieving the intended radii and uniformity shall be approved by the Resident Engineer / Skate Park Designer. If rejected, The Contractor in charge of the specific scope of work shall remove and replace rejected work for the Resident Engineer / Skate Park Designer's approval at no additional cost to the Owner.

3.10 CLEAN UP

- A. At completion of Work, remove concrete stains from adjacent work, including but not limited to dissimilar paving types, walls, columns, railing posts, light fixtures, plant materials, to satisfaction of Resident Engineer / Skate Park Designer.
- B. Efflorescence: Remove efflorescence (as soon as practical after it appears) as part of final cleaning.
- C. Use least aggressive cleaning techniques possible.
- D. Wear protective eye wear, gloves, and clothing suitable to work and as required by cleaner manufacturer.
- E. If proprietary cleaning agents are used, pre-wet wall, test cleaning agent on a small, inconspicuous area, and check effects prior to proceeding. Begin cleaning at the top and work down. Thoroughly rinse wall afterwards with clean water. Follow cleaner manufacturer's instructions.
- F. Do not use muriatic (hydrochloric) acid on colored concrete.

END OF SECTION 03 36 00

**SECTION 03 37 00
CONCRETE CURING**

PART 1 GENERAL

1.01 DESCRIPTION

- A. Provide curing material for cast-in-place concrete flatwork, and shotcrete walls (radial and angled).

1.02 RELATED INFORMATION

- A. Section 03 10 00 - Concrete Forming and Accessories
- B. Section 03 20 00 - Concrete Reinforcing
- C. Section 03 30 00 - Cast-In-Place Concrete
- D. Section 03 36 00 - Shotcrete

1.03 SUBMITTALS

- A. Submit samples and detailed technical data of products proposed for curing use for Owner's approval.
- B. Submit certification that materials meet specification requirements.

1.04 DELIVERY AND STORAGE

- A. Deliver materials in original sealed containers with seal and labels intact. Store in a dry place. Use materials out of original containers only.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Evercrete DPS™ Deep Penetrating Sealer, manufactured by Evercrete Group, or approved non-toxic, odorless, clear, water-soluble liquid compound equivalent.
- B. Curing Agent: ASTM C 309, non-staining, water, or soy based, low or no Volatile Organic compound emitting, compatible with color admixture.

PART 3 EXECUTION

3.01 CURING

- A. Protect concrete surfaces against rapid drying. Keep moist for necessary amount of time to reach concrete strength and inhibit moisture loss after placing.
- B. Curing Method: Spread curing paper over surfaces, lapping ends and sides a minimum of 4", and maintain in place by use of suitable weights for necessary duration, then remove.

3.02 CLEANUP

- A. Remove debris and trash resulting from specified work.

END OF SECTION 03 37 00

**SECTION 05 50 00
METAL FABRICATIONS**

PART 1 GENERAL

1.01 SCOPE

- A. Provide labor, materials, and equipment for the installation of Metal Work as shown on the drawings and as specified.

1.02 RELATED INFORMATION

- A. Section 03 10 00 - Concrete Forming and Accessories
- B. Section 03 20 00 - Concrete Reinforcing
- C. Section 03 30 00 - Cast-In-Place Concrete
- D. Section 03 36 00 - Shotcrete

1.03 QUALITY ASSURANCE

- A. Qualifications of Fabricators: Experienced in fabrication of miscellaneous metals.
- B. Qualifications of Welders: Welding shall be done only by certified welding operators currently qualified according to AWS D1.1.
- C. Qualifications of Workmen: Provide at least one person who shall be always present during execution of this portion of the Work, and who shall be thoroughly familiar with the type of materials being installed, the referenced standards, the requirements of this Work, and who shall direct all work performed under this Section. Welds indicated may be made in shop or field with approval.
- D. Reference Standards:
 - 1. Steel: Meet requirements of AISC "Specifications of Architecturally Exposed Structural Steel," latest edition.
 - 2. Welding: Meet requirements of AWS "Structural Welding Code," D1.1, latest edition.

1.04 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit shop drawings for all custom fabricated items under this section. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories. Indicate welded connections using standard AWS welding symbols.
 - 2. Verification: Verify all measurements at the job. Show dimensions, sizes, thicknesses, gauges, finishes, joining, attachments, and relationship of work to adjoining construction. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at site and not from drawings.
 - 3. Coordination: Coordinate with work of Cast-In-Place Concrete Section 03 30 00 and Section 03 36 00 - Shotcrete .
- B. Samples
 - 1. Required for all Coping and Edging of concrete work. Submit finish metal samples for final finish selection. Submit prior to delivery to site. Attach name, address of manufacturer and/or supplier to each sample.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Coordination
 - 1. Coordinate with work of Cast-In-Place Concrete Section 03 30 00 and Section 03 36 00 - Shotcrete.
- B. Storage of Materials

1. Materials which are stored at the project site shall be above ground on platforms, skids, or other supports. Protect steel from corrosion. Store other materials in a weather-tight and dry place until ready for use.
- C. Protection
 1. Use all means necessary to protect miscellaneous metals before, during and after installation and to protect the installed work and materials of all other trades.
 2. Protect any adjacent materials or areas below from damage due to weld splatter or sparks during field welding.
- D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of and at no additional cost to the Owner.

1.06 JOB CONDITIONS

- A. Examine existing conditions in which the work is to be installed. Notify Owner if conditions are unacceptable to begin work.
- B. Do not proceed with the work until unsatisfactory conditions have been corrected.

1.07 COORDINATION

- A. Templates and Built-ins: Furnish all anchors, fastenings, sleeves, setting templates and layouts affecting or installed in the work of other trades.
- B. Delivery: Where items must be incorporated or built into adjacent work, deliver to trade responsible for such work in sufficient time that progress of work is not delayed. Be responsible for proper location of such items.

1.08 JOB SITE SAMPLE

- A. Contractor to provide fabricated, on site sample of metal item(s), complete with approved finish, for review by Owner before fabrication of total quantities. Any fabrication of project item(s) by Contractor before Owner review and approval is strictly at his own risk and expense.
- B. Approved sample(s) shall be used as the standard of workmanship and shall remain on site until work has been completed and approved by the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

- A. 2" ROUND STEEL PIPE COPING- O.D. 2.375, Thickness .154: ASTM A-53, Type E or S (Fy=35 ksi), Grade B or A-501 (Fy=36 ksi).
- B. 2" ROUND STEEL TUBING- O.D. 2.375 Thickness .154: ASTM A-53, Type E or S (Fy=35 ksi), Grade B or A-501 (Fy=36 ksi).
- C. 2"x6" RECTANGULAR STEEL TUBING- Thickness .188: ASTM A-53, Type E or S (Fy=35 ksi), Grade B or A-501 (Fy=36 ksi).
- D. 6"X1/4"X1-7/8" STEEL C6 C-CHANNEL- Thickness .188: ASTM A-53, Type E or S (Fy=35 ksi), Grade B or A-501 (Fy=36 ksi).
- E. WELDING RODS: E-70 series low hydrogen unless otherwise noted on drawings.

2.02 GROUT

- A. Embecco ® 636 Plus Grout Non-Shrink Mortar Metallic-Aggregate Grout by Degussa Building Systems, Phone (800) 433-9517; Ferrolith ® G Redi-Mix Grout by Sonneborn Building Products.

2.03 OTHER MATERIALS

- A. All other materials, not specifically described but required for a complete and proper installation of miscellaneous metals, shall be new, first quality of their respective kinds and subject to the approval of the Owner.

PART 3 EXECUTION

3.01 EXISTING CONDITIONS

- A. Inspection
 - 1. Prior to all work of this Section, carefully inspect the installed work of all other trades, and verify that all such work is complete to the point where this installation may properly commence.
- B. Discrepancies
 - 1. In the event of discrepancy, immediately notify the Owner.

3.02 COORDINATION

- A. General: Carefully coordinate with all other trades to insure proper and adequate interface of the work of other trades with the work of this Section.
- B. Delivery: Ensure timely delivery of all metal fabrications which must be installed in other work so as not to delay that work.

3.03 INSTALLATION

- A. General
 - 1. Install metal fabrications in strict accordance with the Drawings, the approved Shop Drawings, and all pertinent codes, regulations, and standards.
 - 2. Obtain Owner's review prior to site cutting or adjusting which are not part of scheduled work.
 - 3. Install items square and level, accurately fitted and free from distortion or defects.
 - 4. Align all metal fabrications as shown on the Drawings, and where vertical or horizontal members are shown, align them straight, plumb and level within a tolerance of one in 500.
 - 5. Make provisions for erection stresses by temporary bracing. Keep work in alignment.
 - 6. Replace items damaged in course of installation.
 - 7. Perform field welding in accordance with AWS D1.1
 - 8. After installation, grind, and touch-up field welds.

3.04 WORKMANSHIP

- A. Layout
 - 1. Set all work plumb, true, rigid, and neatly trimmed out. Miter corners and angles of exposed molding and frames unless otherwise noted.
- B. Fitting
 - 1. Fit exposed connections accurately together to form tight hairline joints.
- C. Labor
 - 1. Employ only workmen specifically skilled in such work.

3.05 FABRICATION

- A. Shop assembles in largest practicable dimensions, making members true to length so assembling may be done without fillers.
- B. Provide all surfaces free of file marks, dents, hammer marks, wire edges or any unsightly surface defects.
- C. Steel Pipe Coping
 - 1. Roll pipe to conform to top radius curve of each bowl and ledge as shown on drawings. Refer to drawings for relational tolerance to concrete surface and other steel.

3.06 ATTACHMENTS AND REINFORCEMENTS

- A. Do all cutting, shearing, drilling, punching, threading, tapping, etc., required for site metalwork or for attachment of adjacent work. If applicable, drill or punch holes; do not use cutting torch.

3.07 OTHER CONNECTORS

- A. Make all permanent connections in ferrous metal surfaces using welds where at all possible; do not use bolts or screws.

3.08 WELDING

- A. Preparation
 - 1. Remove all rust, paint, scale, and other foreign matter. Wire brush all flame-cut edges. Clamp members as required and alternate welds, all as necessary to prevent warping or misalignment.
- B. Exposed Welds
 - 1. Uniformly grind smooth (no tolerance) all welds normally exposed to view and feel in the finished work.
- C. Faulty and Defective Welding
 - 1. Chip out and replace all welding showing cracks, slag inclusion, lack of fusion, bad undercut or other defects ascertained by visual or other means of inspection. Replace and re-weld at no cost to Owner.
- D. Field Welding
 - 1. Procedure
 - a. Comply with AWS code of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.
 - 2. Protection
 - a. Protect all adjacent surfaces from damage due to weld sparks, spatter, or tramp metal.

3.09 SURFACE TREATMENT AND PROTECTIVE COATINGS

- A. Cleaning
 - 1. Thoroughly clean all mill scale, rust, dirt, grease, and other foreign matter from ferrous metal prior to any galvanizing and painting.
 - 2. Conditions which are too severe to be removed by hand cleaning, shall be cleaned using appropriate methods for solvent cleaning, power tool cleaning and brush-off blast cleaning.
- B. Exterior Ferrous Metal
 - 1. Grind smooth all welds, burrs, and rough surfaces. Clean and hot - phosphate treat completed assembly. Hot phosphate treatment not required on items which are not exposed in the finish work or on those items where size prohibits such treatment.
 - 2. Galvanize all ferrous metal items.
 - 3. Indicate on Shop Drawings where treatment is proposed to be omitted, if any.

3.10 CLEAN-UP

- A. Keep all areas of work clean, neat, and orderly always. Keep paved areas clean during installation.
- B. Clean up and remove all debris from the entire work area prior to Final Acceptance to standards of Owner.

END OF SECTION 05 50 00

**SECTION 09 90 00
PAINTING (METAL FABRICATIONS)**

PART 1 GENERAL

1.01 GENERAL CONDITIONS

- A. Requirements of the Contract Documents, including but not limited to, the General, Special, and Technical Provisions, apply to work in this Section with the same force and effect as though repeated in full herein.

1.02 SCOPE OF WORK

- A. Furnish materials, labor, transportation, services, and equipment necessary to install all Painting for the Skate Park as indicated on scope of work contract and shown on drawings and as specified herein.
- B. This Section includes surface preparation and field painting of miscellaneous exposed exterior items and surfaces.
- C. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether schedules indicate colors. If the schedules do not indicate color or finish, Contractor or Skate Park Designer shall select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed galvanized steel and iron work, and primed metal surfaces of mechanical and electrical equipment. Contractor to prime metal surfaces only if specified on plans.
- D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Finished metal surfaces include the following if used:
 - a. Stainless steel.
 - b. Bronze and brass.
 - c. Iron
 - 2. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- E. Related Work
 - 1. Section 05 50 00 – Metal Fabrications

1.03 REFERENCES

- A. Comply with the applicable reference specifications as specified in the GENERAL PROVISIONS and in accordance with applicable laws, codes and regulations required by the City or County. Comply with the current provisions of the following Codes and Standards.
 - 1. ASTM - American Society for Testing and Materials
 - 2. IBC – International Building Code
 - 3. SSPC – Society for Protective Coatings: “Steel Structures Painting Manual,” latest edition.

1.04 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
 - 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.

4. Semi-gloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.05 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers.
 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
 1. After color selection, Contractor will furnish color chips for surfaces to be coated.
- C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
 1. Provide stepped Samples, defining each separate coat, including block fillers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
 3. Submit Samples on the following substrates for Skate Park Designer review of color and texture only:
 - a. Ferrous Metal: Provide two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.

1.06 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced Applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
- C. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.08 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules.

2.02 MATERIALS

- A. Material Compatibility: Provide fillers and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Provide color selections made by Skate Park Designer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within an area.

3.02 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each substrate condition and as specified.
 - 1. If specified, provide barrier coats over incompatible primer, or remove and re-prime.

2. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
 - a. if applicable, touch up bare areas and shop-applied prime coats that have been damaged. Wire- brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.03 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. If specified, provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, covers, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer on metal surfaces that have been galvanized or shop primed and touch-up painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow enough time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Fillers: Apply fillers at a rate to ensure complete coverage of pores filled.
- F. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- G. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.04 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
- B. After completing painting, clean paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.05 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by City or County and/or Contractor.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.06 EXTERIOR PAINT SCHEDULE

- A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal.
1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a rust-inhibitive primer, if specified on plans.
 - a. First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).
 - 1) Sherwin Williams: Acrolon 218 HS Acrylic Polyurethane

END OF SECTION 09 90 00

**SECTION 31 00 00
EARTHWORK**

PART 1 GENERAL

1.01 GENERAL CONDITIONS

- A. Requirements of the Contract Documents, including but not limited to, the General, Special, and Technical Provisions, apply to work in this Section with the same force and effect as though repeated in full herein.
- B. Soils Report: The recommendations within the project's soils report shall be incorporated into this specification. In the event of a conflict between the Geotechnical Report and these specifications and the project plans, immediately consult the project's Civil Engineer or Project Manager. To prepare an accurate bid, it is suggested that bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other Geotechnical Reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

1.02 SCOPE OF WORK

- A. Furnish materials, labor, transportation, services, and equipment necessary to perform all earthwork operations related to the Skate Park as indicated on the Drawings complete as shown and as specified herein.
- B. The work of this Section includes all earthwork required for construction of the work. Such earthwork shall include, but not be limited to, the loosening, removing, loading, transporting, depositing, and compacting in its final location of all materials wet and dry, as required for the purposes of completing the work specified in the Contract Documents, which shall include, but not be limited to, the furnishing, placing, and removing of sheeting and bracing if necessary to safely support the sides of all excavation; all pumping, ditching, draining, dewatering, and other required measures for the removal or exclusion of water from the excavation; the supporting of structures above and below the ground; all backfilling around structures and all backfilling of trenches and pits; the disposal of excess excavated materials; alluvial removals, selective grading of expansive soils, soil importing, borrow of materials to make up deficiencies for fills, and all other incidental earthwork, all in accordance with the requirements of the Contract Documents.
- C. Related Work
 - 1. Section 31 23 13 – Sub-Grade Preparation

1.03 REFERENCES

- A. with the applicable reference specifications as specified in the General Provisions. Comply with the applicable reference specifications as specified in the GENERAL PROVISIONS and in accordance with applicable laws, codes and regulations required by the Owner's Representative. Work shall comply with the rules and regulations of local, state, and federal agencies having jurisdiction. Nothing contained herein shall be construed as permitting work that is contrary to such rules, regulations, and codes.
- B. Comply with the current provisions of the following Codes and Standards
 - 1. ASTM - American Society for Testing and Materials.
 - 2. Standard Specifications (as specified in the General Provisions)
 - 3. Latest Uniform Standards issued by the City or County.

1.04 SUBMITTALS

- A. Submittals, including samples of materials, shall be in accordance with the GENERAL PROVISIONS.

- B. Samples: Submit a one-half cubic foot sample of proposed import soils (if required) per the project's soil report for Owner's Representative's review and approval, identify location and source of import soil.

1.05 QUALITY ASSURANCE

- A. General: All soils testing and inspection during earthwork operations, other than agricultural suitability and chemical analysis of proposed soils, will be done by a testing laboratory of the ENGINEER's choice at the contractor's expense except as specified in Paragraph 1.5.C below. Contractor shall be responsible for scheduling the tests and inspections and all tests performed on project soil will be given to the Owner's Representative for review.
- B. Where soil material is required to be compacted to a percentage of maximum dry density, the maximum dry density at optimum moisture content will be determined in accordance with the latest version of ASTM D 1557. In-place field density tests will be performed in accordance with ASTM D 1556, (sand cone) and/or ASTM D 2922 and ASTM D 3017 (nuclear gauge). The number and location of field density tests will be determined by the ENGINEER.
- C. In case the tests of the fill or backfill show non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to ensure compliance. Subsequent testing to show compliance shall be by a testing laboratory selected by the ENGINEER and shall be at the CONTRACTOR's expense. All imported fill material not specified in the contract shall be tested at the CONTRACTOR's expense and approved by the ENGINEER.

1.06 PROJECT CONDITIONS

- A. Existing Conditions: The existing topographic conditions are shown on the drawings for reference only. Upon beginning the earthwork, Contractor represents that he has inspected the site and satisfied himself as to actual grades and levels and the true conditions under which the work is to be performed. Promptly notify the Owner's Representative of unexpected subsurface conditions. The Contractor is required to submit a "Site Acceptance" letter before earthwork operations begin.
- B. Soil Classification: Excavated materials are not classified as to type.

1.07 PROTECTION

- A. Protection
 - 1. Protect excavations by shoring, bracing, sheeting, underpinning, or other methods, as required to prevent cave-ins or loose dirt from entering excavations. Barricade open excavations and post warning lights at work adjacent to public streets and walks.
 - 2. Cover holes and trenches when work is not in progress. Fence or barricade changes of plane more than 45 degrees horizontally and more than 3 feet vertically.
 - 3. Maintain benchmarks, monuments, and other reference points. If disturbed or destroyed, replace as directed.
 - 4. Protect existing berms and slopes from disruption. If slopes are disturbed, return to existing conditions at no additional cost to the Owner.
 - 5. Underpin adjacent structure(s), including utility service lines, which may be damaged by excavation operations.
 - 6. Protect existing natural areas and landscape improvements from damage.
 - 7. Promptly repair damage to adjacent facilities caused by earthwork operations. Cost of repair at Contractor's expense.

PART 2 MATERIALS

2.01 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENT

- A. General: Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, and free from grass, roots, brush, or other vegetation; contamination;

or deleterious material. The size, gradation, and properties of the materials shall be in accordance with the requirements of the Soil Report and these specifications.

- B. Suitable materials may be obtained from onsite excavations, may be processed onsite materials, or may be imported provided these materials meet all the requirements in the Contract Documents. If imported materials are required to meet the requirements of this Section or to meet the quantity requirements of the project, the CONTRACTOR shall provide the imported fill materials and the required conformance reports of test results at no additional expense to the AGENCY, unless a unit price item is included for imported materials (including the appropriate required testing reports) in the bidding schedule.

2.02 FILL FOR MISCELLANEOUS LANDSCAPE WORK

- A. General Landscape Construction
 - 1. Mound Construction: Fill material like existing on-site soil with all rocks, etc., over 4" in diameter removed prior to placement. No rocks larger than 2" diameter are allowed on top 6" of mound.
 - 2. Miscellaneous Landscape Filling: Fill material like existing on-site soil with all rocks, etc. over 2" in diameter removed prior to placement.
 - 3. Remove and dispose of rocks, etc. removed during soil processing offsite.
 - 4. Imported fill material shall be inspected, tested, and approved by the Owner's Representative prior to use in work. Copy of tests will be given to the City or County.

2.03 PLANTING SOIL FOR PLANT BACKFILL

- A. Native soil shall be tilled and free of noxious weeds and chemicals. Soil must be approved as growing medium from Soils Lab Report with any supplementary additives as directed by Soils Lab Report. Copy of Soils Lab Report will be given to the Owner's Representative.

2.04 USE OF FILL AND BACKFILL MATERIAL TYPES

- A. The CONTRACTOR shall use the types of materials as designated on the Drawings and herein for all required fill, backfill, and embankment construction hereunder.
- B. Where these Specifications conflict with the requirements of any local agency having jurisdiction, or with the requirements of a material manufacturer, the ENGINEER shall be immediately notified. In case of conflict therewith, the CONTRACTOR shall use the more stringent requirement, as determined by the ENGINEER.

PART 3 EXECUTION

3.01 PREPARATION

- A. Establish extent of grading and excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels, and elevations.
- B. Do not cover or enclose work of this Section before obtaining required inspections, tests, approvals, and location recording.

3.02 EXISTING UTILITIES

- A. Before starting grading and excavation, establish the location and extent of underground utilities in the work area. Exercise care to protect existing utilities during earthwork operations. Perform excavation work near utilities by hand and provide necessary shoring, sheeting, and supports as the work progresses.
- B. Maintain, protect, relocate, or extend, as required, existing utility lines to remain which pass through the work area. Pay costs for this work, except as covered by the applicable utility companies.
- C. Protect active utility services uncovered by excavation. Notify respective utility companies of damage caused to active utilities immediately.

- D. Remove abandoned utility service lines from areas of excavation. Cap, plug, or seal abandoned lines and identify termination points at grade level with markers.
- E. Accurately locate and record abandoned, and active utility lines rerouted or extended on project record documents.

3.03 SITE GRADING – GENERAL

- A. Perform grading within contract limits, including adjacent transition areas, to new elevations, levels, profiles, and contours indicated. Provide uniform levels and slopes between new elevations and existing grades.
- B. Obtain approval of scarified subgrade surfaces by Owner's Representative prior to filling operations. Scarify, dry, and compact soft and wet areas; remove and replace unsuitable subgrade materials with an approved fill material. Take corrective measures before placing fill materials.
- C. Thoroughly scarify existing soil surface to a depth of 10" and verify scarification with Owner's Representative prior to placing fill material in mounded areas.
- D. Spread approved fill material uniformly in layers not greater than 12" of loose thickness over entire fill zones of planting areas.
 - 1. Lift thickness requirements may be modified by Owner's Representative to suit equipment and materials or other conditions when required to assure satisfactory compaction.
 - 2. Place and compact each layer of fill before placing additional fill material. Repeat filling until proposed grade, profile or contour is attained.
 - 3. Suspend fill operations when satisfactory results cannot be obtained because of environmental or other unsatisfactory site conditions. Do not use over-saturated fill materials. Do not place fill material on over-saturated subgrade surface.
 - 4. Grade surfaces to assure positive drainage and to prevent ponding and pockets of surface drainage. Install drainage swales as indicated on the Drawings.
 - 5. Protect finish graded areas from traffic and erosion. Keep free of trash and debris. Repair and reestablish grades in settled, eroded, and damaged areas.
- E. If, in the opinion of the Owner's Representative, the completed site grading does not reflect the Contract Documents, an independent surveyor may be hired to verify the grades. If the grades are correct, the Owner will pay for the survey. If the grades are incorrect, the cost of the survey will be deducted from the Contract price.

3.04 BACKFILLING / FILLING FOR PAVING & WALLS

- A. Before filling, remove debris, large rocks, formwork, and loose material.
- B. Proof-roll areas to receive fill with rubber-tired roller of sufficient weight. Weak areas or areas where excessive pumping is noted shall be removed, and if required by Owner's Representative, replaced with select fill.
- C. Prior to placing fill, scarify surface to a depth of 6 inches. Moisture content of loosened material shall be such that first layer of fill will readily bond to surface.
- D. Top 6 inches shall be free from rocks larger than 3 inches diameter.
- E. Place in maximum 8-inch lifts and compact per ASTM D 1557 at optimum moisture content (-1% to +3%). This lift and compaction requirement does not apply to planting areas.
- F. Moisten fill to allow drying to correct moisture content before compaction. Do not place fill on subgrade that is over-saturated.
- G. Allowing for total thickness of finish paving and base material, fill under paving to bring subgrade to proper elevation.
- H. Soft areas that develop under construction operations shall be scarified, aerated, or moistened. Compact to full depth required to obtain specified density for each layer.

3.05 EXCAVATING

- A. It is the Contractor's responsibility to investigate the likelihood of caliches or hard rock excavation. The Owner will not provide any additional compensation to the Contractor for hard rock or caliches excavation.

3.06 FINISH GRADING

- A. Grade uniformly with rounded surfaces at tops and bottoms of abrupt changes in plane. Hand grade steep slopes, areas that are inaccessible for machine work and areas around existing plants.
- B. Slope graded surfaces to drain water away from structures, walls, etc.; minimum slope is 1/4 inch per foot.
- C. Grade areas to elevation and slopes indicated without depressions causing pocketing of surface water or humps, producing localized runoff and erosion. Ponding of water on site is not allowed. Finish surfaces to be not more than 0.10 foot above or below established grade elevation unless approved in writing by Owner's Representative.
- D. See Section on Soil Preparation and Soil Mixes for additional fine grading requirements.

3.07 DRAINAGE

- A. Always provide drainage of the working area.

3.08 DISPOSAL OF WASTE MATERIALS

- A. Refer to Construction and Demolition Waste Management Specifications for actions required regarding the disposal and diversion of all excess / waste materials, including excess excavated material and rock from the site

3.09 CLEANING

- A. Upon completion of earthwork operation, clean areas within contract limits, remove tools and equipment.
- B. Provide site clear, clean, free of debris and suitable for site work operations.
- C. Remove and dispose of properly off site all rocks and other debris from grading operations at approved recycling centers, refer to Construction and Demolition Waste Management Specifications for actions required with regards to the disposal and diversion of all excess/ waste materials.

END OF SECTION 31 00 00

**SECTION 31 10 00
SELECTIVE CLEARING**

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work Included: Perform selective clearing of trees and complete as shown, and as specified.
- B. Related Work:
 - 1. Section 31 20 00 - Earthwork

1.02 JOB CONDITIONS

- A. Protection of Existing Plants to Remain, refer to Common Work Results for Existing Conditions
- B. Work Schedule: Proceed and coordinate with the work as the site becomes available, consistent with seasonal limitations for clearing and transplanting.

1.03 SELECTION AND TAGGING OF TREES

- A. Owner's Representative will select and tag at the site, those trees to be saved and removed.

PART 2 PRODUCTS (CONTRACTOR'S OPTION)

PART 3 EXECUTION

3.01 TREES TO BE CLEARED (IF APPLICABLE)

- A. General: Refer to drawings for locations.
- B. Special Conditions: Clear trees in areas only at the direction of the owner's representative.
- C. Stump Removal: Grind or remove tree stumps to a minimum depth of two (2) ft. below proposed finish grade.
- D. Disposal: Dispose of cleared trees off the site unless otherwise directed by Owner's Representative.

3.02 CLEAN-UP

- A. Keep all areas of work clean, neat, and orderly always.
- B. Clean up and remove all debris from the entire work area prior to Final Acceptance.
- C. Work Schedule: Proceed and coordinate with the work as the site becomes available, consistent with seasonal limitations for clearing and transplanting.

END OF SECTION 31 10 00

**SECTION 31 23 00
SUBGRADE PREPARATION**

PART 1 GENERAL

1.01 GENERAL CONDITIONS

- A. Requirements of the Contract Documents, including but not limited to, the General, Special, and Technical Provisions, apply to work in this Section with the same force and effect as though repeated in full herein.

1.02 SCOPE OF WORK

- A. Furnish materials, labor, transportation, services, and equipment necessary to perform all sub-grade preparation work for the Skate Park as indicated on the Drawings complete as shown and as specified herein.
- B. Related Work:
 - 1. Section 31 20 00 – Earthwork
 - 2. Section 03 10 00 – Concrete Forming and Accessories
 - 3. Section 03 20 00 – Concrete Reinforcing
 - 4. Section 03 30 00 – Cast-In-Place Concrete
 - 5. Section 03 37 13 – Shotcrete

1.03 SUBMITTALS

- A. Contractor to provide data indicating the total of post-industrial and post-consumer recycled aggregate base content throughout the Skate Park equaling the recommendations of the Geotechnical Engineer's Report

1.04 REFERENCES

- A. Comply with the Geotechnical Engineer's Report and applicable reference specifications as specified in the GENERAL PROVISIONS and in accordance with applicable laws, codes and regulations required by Owner's Representative.
- B. Comply with the current provisions of the following Codes and Standards:
 - 1. ASTM - American Society for Testing and Materials.
 - 2. Latest Uniform Standard Specifications issued by the City or County.

PART 2 MATERIALS

2.01 SUITABLE MATERIALS

- A. General: Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, and free from grass, roots, brush, or other vegetation; contamination; or deleterious material. The size, gradation, and properties of the materials shall be in accordance with the recommendations of the Geotechnical Engineer's Report.
- B. Aggregate base materials under pavements shall be crushed aggregate base material with a recycled content per recommendations of the Geotechnical Engineer's Report.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

- A. Excavate and shape subgrade to line, grade, and cross-section shown on the Drawings.
- B. Subgrade is that area on which pavement, surfacing, base, sub-base, or a layer of other material which may be specified, is to be placed.
- C. Plow or scarify subgrade to a depth of below the final subgrade elevation per recommendations of the Geotechnical Engineer's Report and by harrowing, dry rolling and breaking clods, the

earth shall be brought to finely divided condition. Remove boulders, hardened material, or rock encountered. The earth shall be uniform for the full depth and width of the subgrade.

- D. Water loose earth to a uniform depth per recommendations of the Geotechnical Engineer's Report.
- E. Harrow the earth to mix the wet earth with the dry beneath, until the whole mass of loose material is at the proper state of moisture for compaction.
- F. The finished subgrade, immediately prior to placing subsequent material thereon, shall be in accordance with the Standard Specifications and per recommendations of the Geotechnical Engineer's Report.
- G. The finished surface of the subgrade, at any point, shall not vary more than recommendations of the Geotechnical Engineer's Report.
- H. The Owner will not provide any additional compensation to the Contractor for hard rock or caliches excavation. Refer to the recommendations of the Geotechnical Engineer's Report for test boring information and analysis.

3.02 BASE

- A. Base shall be readily compacted and spread with equipment that will provide a uniform layer conforming to the planned section.

3.03 CLEANUP

- A. Upon completion of the subgrade preparation and base, remove surplus construction materials, earth, and debris so that the job site is left in a neat and orderly condition.

END OF SECTION 31 23 00

APPENDICIES

SKATE PARK CONTRACTOR PRE-QUALIFICATION STATEMENT

The intent of the City of Fruita, CO is to pre-qualify builders for this project who have demonstrated a record of successfully executing projects as a skate park constructor. This qualification statement will determine the bidder's qualification for this project. Submission of this questionnaire does not constitute qualification.

THIS PRE QUALIFICATION STATEMENT IS REQUIRED FOR SUBMISSION PRIOR TO THE BID ON THE DATE IDENTIFIED IN THE CONTRACT DOCUMENTS. IF THE PRE-QUALIFICATION STATEMENT IS NOT APPROVED AS A QUALIFIED CONTRACTOR, THE CONTRACTOR MAY NOT SUBMIT A BID ON THIS PROJECT.

Please complete the information below.

1. BIDDER INFORMATION

SKATE PARK BIDDER (Show Complete Legal Name) _____

STREET ADDRESS OF MAIN OFFICE _____

MAILING ADDRESS _____

CITY _____ STATE _____ ZIP _____ PHONE # _____

CONTACT PERSON _____ E-MAIL _____ FAX # _____

CONTRACTOR I.D. NO./ FEDERAL TAX I.D. NO. _____

APPLICATION SUBMITTED BY _____ TITLE _____

SKATE PARK BIDDER IS ORGANIZED AS A: _____ DATE OF ORGANIZATION: _____

IF A CORPORATION, THE STATE WHERE IT IS INCORPORATED _____

HOW MANY YEARS HAS YOUR ORGANIZATION BEEN IN BUSINESS UNDER YOUR PRESENT BUSINESS NAME? _____ YEARS

HAS ANY OFFICER OR PARTNER OF YOUR ORGANIZATION EVER BEEN AN OFFICER OR PARTNER OF THIS OR ANOTHER ORGANIZATION THAT FAILED TO COMPLETE A CONSTRUCTION CONTRACT? YES NO IF YES, STATE NAME OF INDIVIDUAL, OTHER ORGANIZATION AND REASON THEREFOR: _____

LIST ANY LITIGATION WITH THE OWNERS OF PROJECTS IN THE PAST FIVE YEARS: _____

HAVE YOU EVER FAILED TO QUALIFY OR PREQUALIFY AS A BIDDER? YES NO IF YES, WHEN, WHERE AND WHY? _____

Under what other or former names has the bidder operated?

1. _____
2. _____
3. _____

If the bidder is a corporation, provide the following information.

1. Date of incorporation _____
2. State of incorporation _____
3. President's name _____
4. Vice presidents name _____
5. Secretary's name _____
6. Treasurer's name _____
7. Do you have a certificate of good standing issued by the state in which you are incorporated? _____

If the bidder is a partnership, provide the following information.

1. Date of organization _____
2. Type of partnership _____
3. General partner(s) names _____

If the bidder is individually owned provide the following information.

1. Date of organization _____
2. Owner's name _____

If the bidder is a joint venture, provide the following information.

1. Primary bidder _____
2. Secondary bidder _____
3. Date of organization _____

General character or work performed by your company:

Have you ever been debarred or suspended by a government from consideration for the award of contracts?
_____ If so, where and why? _____

Have you ever been charged liquidated damages on a contract? _____ If so, where and why? _____

Equipment: Do you have all equipment necessary for shotcrete construction? _____
Do you have all equipment necessary for flatwork construction? _____

Bonding limit: \$ _____

Bonding Company: _____

Address: _____

Bank reference: _____

2. Current Projects in Progress

Please provide a list of all major construction projects that are in progress by the bidder. The projects listed must have a construction agreement executed between the bidder and the owner. Utilize additional sheets of paper if necessary.

Project No. 1

1. Name of project _____
2. Name of owner _____
3. Contact Name & Phone No. _____
4. Name of Architect/Engineer & PHONE # _____
5. Contract amount _____
6. Were performance/payment bonds required? _____
7. Bonding company _____
8. Percent complete _____
9. Scheduled completion _____
10. Percentage of the cost of work performed with your own forces _____
11. Specific similar construction character to Sandstone Ranch Ph 3: _____

Project No. 2

1. Name of project _____
2. Name of owner _____
3. Contact Name & Phone No. _____
4. Name of Architect/Engineer _____
5. Contract amount _____
6. Were performance/payment bonds required? _____
7. Bonding company _____
8. Percent complete _____
9. Scheduled completion _____
10. Percentage of the cost of work performed with your own forces _____
11. Specific similar construction character to Sandstone Ranch Ph 3: _____

Project No. 3

1. Name of project _____
2. Name of owner _____
3. Contact Name & Phone No. _____
4. Name of Architect/Engineer _____
5. Contract amount _____
6. Were performance/payment bonds required? _____
7. Bonding company _____
8. Percent complete _____
9. Scheduled completion _____
10. Percentage of the cost of work performed with your own forces _____
11. Specific similar construction character to Sandstone Ranch Ph 3: _____

List the construction experience and expected availability of the key management and supervisory individuals of the contractor. Resumes may be submitted as a substitution to this list. Utilize additional sheets if necessary.

2. Past Projects

Please provide a list of construction projects of a similar nature to the advertised project that have been completed by the bidder. Projects will be considered similar if they include concrete in-ground bowls, steel coping and above ground grind rails & concrete ledges. **Not all projects must include all of the above similar characteristics, but all projects listed must include at least one of each element. Shotcrete concrete bowls, steel coping, grind rails and concrete ledge construction experience must be shown in the projects listed.** Provide enough projects to show that all of the above characteristics of this project have been done successfully by the contractor. The projects listed must have a construction agreement executed between the bidder and the owner. Utilize additional sheets of paper if necessary.

Project No. 1

1. Name of project _____
 2. Name of owner _____
 3. Contact Name & Phone No. _____
 4. Name of Architect/Engineer _____
 5. Contract amount _____
 6. Were performance/payment bonds required? _____
 7. Bonding company _____
 8. Scope of Work _____
 9. Completion Date _____
 10. Percentage of the cost of work performed with your own forces _____
 11. Specific similar construction character to Sandstone Ranch Ph 3: _____
-

Project No. 2

1. Name of project _____
 2. Name of owner _____
 3. Contact Name & Phone No. _____
 4. Name of Architect/Engineer _____
 5. Contract amount _____
 6. Were performance/payment bonds required? _____
 7. Bonding company _____
 8. Scope of Work _____
 9. Completion Date _____
 10. Percentage of the cost of work performed with your own forces _____
 11. Specific similar construction character to Sandstone Ranch Ph 3: _____
-

Project No. 3

1. Name of project _____
 2. Name of owner _____
 3. Contact Name & Phone No. _____
 4. Name of Architect/Engineer _____
 5. Contract amount _____
 6. Were performance/payment bonds required? _____
 7. Bonding company _____
 8. Scope of Work _____
 9. Completion Date _____
 10. Percentage of the cost of work performed with your own forces _____
 11. Specific similar construction character to Sandstone Ranch Ph 3: _____
-

Provide a list of any sub-contractors and their expertise to be used that may help you to qualify for this project. Utilize additional sheets if necessary.

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Additional Questionnaire (must be filled out in its entirety. Utilize additional sheets if necessary)

Have you ever excavated a below ground structure like a swimming pool or skate park bowl and prepared it for shotcrete application? _____

Have you installed bent or rolled steel coping on concrete skate park bowls or similar structures? _____

Have you installed bent or rolled steel coping on concrete skate park ledges or similar structures? _____

Have you installed at least one 20,000 S.F. of shotcrete in a skate park bowl / transitions? _____

Have you sculpted and finished shotcrete surfaces with a uniform smooth trowel finish? _____

Have you received any complaints about the geometry or final finish of the transitions, flat work or cast in place structures constructed in your skate parks? _____ (if yes, explain on additional sheet)

Do you have any liability claims against you or your company relating to the performance of your skate park installations? _____ (if yes, explain on additional sheet)

Have you ever had to repair/ replace or extend a warranty on a skate park for the finish of surface, coping placement, or other problems? _____ (if yes, explain on additional sheet)

Have you ever been required to replace or reconstruct portions or all of a skate park you built? _____ (if yes, explain on additional sheet).

The bidder hereby agrees that all the information submitted above is true and correct.

This Bid will not be considered unless this form has been fully completed and signed by the Bidder, and notarized, dated and completed by the Notary Public.

Name of Individual, Partnership, Limited Liability Company,
or Corporation herein called Bidder

Signature of Skate Park Bidder or Authorized Agent

Type or print name and title of person who signed above

STATE OF _____)
COUNTY OF _____) §

This instrument was subscribed, acknowledged and sworn to before me this _____ day of _____, 2005, by _____ (type or print the name of person signing above) as the above named BIDDER, or Bidder's Authorized Agent.

My Commission expires/Commission Number: _____
Notary Public _____

THIS FORM IS REQUIRED TO BE SUBMITTED PER BIDDING INSTRUCTIONS IN ORDER TO PRE-QUALIFY FOR THE BROKEN ARROW – SKATE PARK CONSTRUCTION WORK.

City of Fruita

Department of Public Works
Engineering Division

Reed Park Improvements Project CIP Project #130-795-77-4730

7. Geotechnical Investigation



Huddleston-Berry
Engineering & Testing, LLC

**GEOTECHNICAL AND GEOLOGIC HAZARDS
INVESTIGATION
REED PARK IMPROVEMENTS
FRUITA, COLORADO
PROJECT#00207-0013**

**CITY OF FRUITA
325 E. ASPEN AVENUE
FRUITA, COLORADO 81521**

NOVEMBER 2, 2022

**Huddleston-Berry Engineering and Testing, LLC
2789 Riverside Parkway
Grand Junction, Colorado 81501**

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

A geologic hazards and geotechnical investigation was conducted for the Reed Park Improvements project in Fruita, Colorado. The project location is shown on Figure 1 – Site Location Map. The purpose of the investigation was to evaluate the surface and subsurface conditions at the site with respect to geologic hazards, foundation design, pavement design, and earthwork for the proposed construction. This summary has been prepared to include the information required by civil engineers, structural engineers, and contractors involved in the project.

Subsurface Conditions (p. 2)

The subsurface investigation consisted of three borings, drilled on September 28th, 2022. The locations of the borings are shown on Figure 2 – Site Plan. The borings generally encountered native clay soils above native sand soils. Groundwater was encountered in the subsurface at depths of between 6.5 and 8.5 feet at the time of the investigation. The native clay soils were indicated to be slightly plastic and to range from slightly collapsible to slightly expansive. The native sand soils were indicated to be non-plastic and are anticipated to tend to compress under loading.

Geologic Hazards and Constraints (p. 3)

The primary geologic hazard and constraint at the site is the presence of moisture sensitive soils. However, the presence of shallow groundwater will also likely impact the construction.

Summary of Foundation Recommendations

- *Foundation Type* – Spread Footings or Monolithic Structural Slabs (p. 4)
- *Structural Fill* – Minimum of 24-inches below foundations. Due to their plasticity, the native soils are not suitable for reuse as structural fill. Imported structural fill should consist of granular material approved by HBET.(p. 4)
- *Maximum Allowable Bearing Capacity* – 1,500 psf. (p. 5)
- *Subgrade Modulus* – 200 pci for approved imported materials. (p. 5)
- *Lateral Earth Pressure* – 50 pcf active. 70 pcf at-rest. (p. 5)

Summary of Pavement Recommendations (p. 6)

Automobile Parking Areas

EDLA = 5, Structural Number = 2.75

ALTERNATIVE	PAVEMENT SECTION (Inches)				TOTAL
	Hot-Mix Asphalt Pavement	CDOT Class 6 Base Course	CDOT Class 3 Subbase Course	Concrete Pavement	
A	3.0	10.0			13.0
B	4.0	7.0			11.0
C	3.0	6.0	6.0		15.0
Rigid Pavement		6.0		6.0	12.0

Truck Traffic Areas

EDLA = 20, Structural Number = 3.50

ALTERNATIVE	PAVEMENT SECTION (Inches)				
	Hot-Mix Asphalt Pavement	CDOT Class 6 Base Course	CDOT Class 3 Subbase Course	Concrete Pavement	TOTAL
A	3.0	15.0			18.0
B	4.0	12.0			16.0
C	3.0	6.0	13.0		22.0
Rigid Pavement		6.0		8.0	14.0

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FIGURES

Figure 1 – Site Location Map

Figure 2 – Site Plan

APPENDICES

Appendix A – UDSA NRCS Soil Survey Data

Appendix B – Typed Boring Logs

Appendix C – Laboratory Testing Results

1.0 INTRODUCTION

As part of the continued infrastructure improvements, the City of Fruita proposes improvements to Reed Park. As part of the development process, Huddlestone-Berry Engineering and Testing, LLC (HBET) was retained by the City of Fruita to conduct a geologic hazards and geotechnical investigation at the site.

1.1 Scope

As discussed above, a geologic hazards and geotechnical investigation was conducted for the Reed Park Improvements project in Fruita, Colorado. The scope of the investigation included the following components:

- Conducting a subsurface investigation to evaluate the subsurface conditions at the site.
- Collecting soil samples and conducting laboratory testing to determine the engineering properties of the soils at the site.
- Providing recommendations for foundation type and subgrade preparation.
- Providing recommendations for bearing capacity.
- Providing recommendations for lateral earth pressure.
- Providing recommendations for drainage, grading, and general earthwork.
- Providing recommendations for pavements.
- Evaluating potential geologic hazards at the site.

The investigation and report were completed by a Colorado registered professional engineer in accordance with generally accepted geotechnical and geological engineering practices. This report has been prepared for the exclusive use of the City of Fruita.

1.2 Site Location and Description

At the time of the investigation, the site was an open park and fairly flat. Vegetation consisted primarily of lawn grasses. The park was bordered to the north by existing residential properties and McCune Avenue, to the south by existing residential properties, to the west by Elm Street, and to the east by Maple Street.

1.3 Proposed Construction

The proposed construction is anticipated to include new small structures, utility installation, and pavements. The proposed structures may be wood framed, steel framed, or masonry.

2.0 GEOLOGIC SETTING

2.1 Soils

Soils data was obtained from the USDA Natural Resource Conservation Service Web Soil Survey. The data indicates that the soils at the site consist of Sagers silty clay loam, 0 to 2 percent slopes. Soil survey data, including descriptions of the soil units, is included in Appendix A.

Structure construction in the site soils is described as being somewhat limited due to shrink-swell. The site soils are indicated to have a moderate potential for frost action, moderate risk of corrosion of uncoated steel, and moderate risk of corrosion of concrete.

2.2 Geology

According to the *Geologic Map of the Fruita Quadrangle, Mesa County, Colorado* (2009), the site is underlain by alluvial mudflow and fan valley fill deposits.

2.3 Groundwater

Groundwater was encountered in the subsurface at depths of between 6.5 and 8.5 feet at the time of the investigation.

3.0 FIELD INVESTIGATION

3.1 Subsurface Investigation

The subsurface investigation was conducted on September 28th, 2022 and consisted of three borings as shown on Figure 2 – Site Plan. The borings were drilled to a depth of 20.0 feet below the existing ground surface. Typed boring logs are included in Appendix B. Samples of the native soils were collected during Standard Penetration Testing (SPT) and/or bulk sampling methods at the locations shown on the logs.

As indicated on the logs, the subsurface conditions at the site were fairly consistent. The borings encountered 1.0 foot of topsoil and/or pavement section materials above brown, moist to wet, very soft to stiff lean clay with sand soils to depths of between 12.0 and 19.0 feet. The clay soils were underlain by brown, wet, loose to medium dense silty sand soils to the bottoms of the borings. As discussed previously, groundwater was encountered at depths of between 6.5 and 8.5 feet at the time of the investigation.

3.2 Field Reconnaissance

The field reconnaissance included walking the site during the subsurface investigation. In general, the site was fairly level and no evidence of active landslides, debris flows, rockfalls, etc. was observed.

4.0 LABORATORY TESTING

Selected native soil samples collected from the borings were tested in the Huddleston-Berry Engineering and Testing LLC geotechnical laboratory for natural moisture content determination, grain size analysis, Atterberg limits determination, maximum dry density and optimum moisture content (Proctor) determination, water soluble sulfates content determination, and California Bearing Ratio (CBR) determination. The laboratory testing results are included in Appendix C.

The laboratory testing results indicate that the native clay soils are slightly plastic. In general, based upon the Atterberg limits of the materials and upon our experience with similar soils in the vicinity of the subject site, the native clay soils are anticipated to be slightly collapsible at their existing density. However, the CBR results suggest that the native soils may expand as much as 1.5% when compacted and introduced to excess moisture.

The native sand soils were shown to be non-plastic. The native sand soils are anticipated to compress under loading; however, the sands are at a depth beyond the zone of influence of lightly loaded shallow foundations.

5.0 GEOLOGIC INTERPRETATION

5.1 Geologic Hazards

The primary geologic hazard at the site is the presence of moisture sensitive soils.

5.2 Geologic Constraints

The primary geologic constraint to construction at the site is the presence of moisture sensitive soils. However, shallow groundwater was also encountered at the site.

5.3 Water Resources

No water supply wells were observed on the property. However, shallow groundwater was encountered at the site. In general, with proper design and construction, development of the site is not anticipated to adversely affect surface water or groundwater.

5.4 Mineral Resources

Potential mineral resources in Western Colorado generally include gravel, uranium ore, and commercial rock products such as flagstone. However, economic valuation of the site soils with regard to their suitability as a commercial quality resource was beyond the scope of this investigation.

6.0 CONCLUSIONS

Based upon the available data sources, field investigation, and nature of the proposed construction, HBET does not believe that there are any geologic conditions which should preclude construction at the site. However, the presence of moisture sensitive soils and shallow groundwater may impact the design and construction.

7.0 RECOMMENDATIONS

7.1 Foundations

Based upon the results of the subsurface investigation and nature of the proposed construction, shallow foundations are generally recommended. Spread footings and monolithic (turndown) structural slab foundations are both appropriate alternatives. However, in order to provide a uniform bearing stratum and reduce the risk of excessive differential movements, it is recommended that the foundations be constructed above a minimum of 24-inches of structural fill.

Due to their potential for expansion, the native clay soils are not suitable for reuse as structural fill. Imported structural fill should consist of a granular, non-expansive, non-free draining material approved by HBET.

For spread footing foundations, the footing areas may be trenched. However, for monolithic slab foundations, the structural fill should extend across the entire building pad area to a depth of 24-inches below the turndown edges. Structural fill should extend laterally beyond the edges of the foundations a distance equal to the thickness of structural fill for both foundation types.

Prior to placement of structural fill, it is recommended that the bottom of the foundation excavation be scarified to a depth of 6 to 8 inches, moisture conditioned, and compacted to a minimum of 95% of the standard Proctor maximum dry density, within $\pm 2\%$ of the optimum moisture content as determined in accordance with ASTM D698. However, as discussed previously, soft soils were encountered at the site and this may make compaction of the subgrade difficult. It may be necessary to utilize geotextile and/or geogrid in conjunction with up to 30-inches of additional granular fill to stabilize the subgrade. HBET should be contacted to provide specific recommendations for subgrade stabilization based upon the actual conditions encountered during construction.

Structural fill should be moisture conditioned, placed in maximum 8-inch loose lifts, and compacted to a minimum of 95% of the standard Proctor maximum dry density for fine grained soils and 90% of the modified Proctor maximum dry density for coarse grained soils, within $\pm 2\%$ of the optimum moisture content as determined in accordance with ASTM D698 and D1557, respectively. Structural fill should be extended to within 0.1-feet of the bottom of the foundation. No more than 0.1-feet of gravel should be placed below the footings or turndown edge as a leveling course.

For structural fill consisting of the native soils or imported granular materials, and foundation building pad preparation as recommended, a maximum allowable bearing capacity of 1,500 psf may be used. In addition, a modulus of 200 pci may be used for structural fill consisting of approved imported materials. Foundations subject to frost should extend a minimum of 24-inches below finished grade.

7.2 Corrosion of Concrete and Steel

As discussed previously, the USDA Soil Survey Data indicates that the site soils have a moderate potential for corrosion of concrete. In addition, water soluble sulfates were detected in the site soils in a concentration of 0.2%. This concentration represents a severe risk of sulfate attack on concrete. The International Building Code (IBC) recommends Type V cement for this concentration of sulfates. However, Type V is not readily available in Western Colorado. Therefore, at a minimum, Type I-II sulfate resistant cement is recommended for construction at this site.

The Soil Survey Data also indicates that the site soils have a moderate potential for corrosion of uncoated steel. Therefore, buried steel utilities or other buried steel structural elements should consider corrosion in their design.

7.3 Non-Structural Floor Slabs and Exterior Flatwork

To help limit the potential for excessive movement of non-structural floor slabs, it is recommended that non-structural floor slabs be constructed above a minimum of 18-inches of structural fill with subgrade preparation and fill placement in accordance with the *Foundations* section of this report. It is recommended that exterior flatwork be constructed above a minimum of 12-inches of structural fill.

7.4 Lateral Earth Pressures

Stemwalls and/or retaining walls should be designed to resist lateral earth pressures. For backfill consisting of the native soils or imported granular, non-free draining, non-expansive material, we recommend that the walls be designed for an active equivalent fluid unit weight of 50 pcf in areas where no surcharge loads are present. An at-rest equivalent fluid unit weight of 70 pcf is recommended for braced walls. Lateral earth pressures should be increased as necessary to reflect any surcharge loading behind the walls.

7.5 Drainage

Due to the presence of moisture sensitive soils at the site, proper site grading is critical to the performance of the structures. In order to improve the long-term performance of the foundations and slabs-on-grade, grading around the structures should be designed to carry precipitation and runoff away from the structures. It is recommended that the finished ground surface drop at least twelve inches within the first ten feet away from the structures. However, where impermeable surfaces (i.e. pavements, sidewalks, etc.) are adjacent to the structures, the grade can be reduced to approximately 2.5-inches (ADA grade) within the first ten feet away from the structures.

HBET recommends that downspout extensions be used which discharge a minimum of 15 feet from the structure or beyond the backfill zone, whichever is greater. However, if subsurface downspout drains are utilized, they should be carefully constructed of solid-wall PVC and should daylight a minimum of 15 feet from the structures. In addition, an impermeable membrane is recommended below subsurface downspout drains. Dry wells should not be used.

7.6 Excavations

Excavations in the soils at the site may stand for short periods of time but should not be considered to be stable. Trenching and excavations should be sloped back, shored, or shielded for worker protection in accordance with applicable OSHA standards. The soils generally classify as Type C soil with regard to OSHA's *Construction Standards for Excavations*. For Type C soils, the maximum allowable slope in temporary cuts is 1.5H:1V.

7.7 Pavements

The proposed construction may include paved automobile and truck traffic areas. As discussed previously, the pavement subgrade materials consist primarily of clay soils. The design California Bearing Ratio (CBR) of the native soils was determined in the laboratory to be less than 2.0. Therefore, the minimum recommended Resilient Modulus of 3,000 psi was used for the pavement design.

Based upon the subgrade conditions and anticipated traffic loading, flexible and rigid pavement section alternatives were developed in accordance with AASHTO design methodologies. The following minimum pavement section alternatives are recommended:

Automobile Parking Areas

EDLA = 5, Structural Number = 2.75

ALTERNATIVE	PAVEMENT SECTION (Inches)				
	Hot-Mix Asphalt Pavement	CDOT Class 6 Base Course	CDOT Class 3 Subbase Course	Concrete Pavement	TOTAL
A	3.0	9.0			12.0
B	4.0	7.0			11.0
C	3.0	6.0	6.0		15.0
Rigid Pavement		6.0		6.0	12.0

Truck Traffic Areas

EDLA = 20, Structural Number = 3.50

ALTERNATIVE	PAVEMENT SECTION (Inches)				
	Hot-Mix Asphalt Pavement	CDOT Class 6 Base Course	CDOT Class 3 Subbase Course	Concrete Pavement	TOTAL
A	3.0	15.0			18.0
B	4.0	12.0			16.0
C	3.0	6.0	13.0		22.0
Rigid Pavement		6.0		8.0	14.0

Prior to pavement placement, areas to be paved should be stripped of all topsoil, fill, or other unsuitable materials. It is recommended that the subgrade soils be scarified to a depth of 12-inches; moisture conditioned, and recompact to a minimum of 95% of the standard Proctor maximum dry density, within $\pm 2\%$ of optimum moisture content as determined by AASHTO T-99. However, as discussed previously, soft soils were encountered at the site. It may be necessary to utilize geotextile and/or geogrid in conjunction with up to 30-inches of granular fill to stabilize the subgrade. HBET should be contacted to provide specific recommendations for subgrade stabilization based upon actual conditions encountered during construction.

Aggregate base course and subbase course should be placed in maximum 9-inch loose lifts, moisture conditioned, and compacted to a minimum of 95% and 93% of the maximum dry density, respectively, at -2% to +3% of optimum moisture content as determined by AASHTO T-180. In addition to density testing, base course should be proofrolled to verify subgrade stability.

It is recommended that Hot-Mix Asphaltic (HMA) pavement conform to CDOT grading SX or S specifications and consist of an approved 75 gyration Superpave method mix design. HMA pavement should be compacted to between 92% and 96% of the maximum theoretical density. An end point stress of 50 psi should be used. It is recommended that rigid pavements consist of CDOT Class P concrete or alternative approved by the Engineer. In addition, pavements should conform to local specifications.

The long-term performance of the pavements is dependent on positive drainage away from the pavements. Ditches, culverts, and inlet structures in the vicinity of paved areas must be maintained to prevent ponding of water on the pavement.

8.0 GENERAL

The recommendations included above are based upon the results of the subsurface investigation and on our local experience. These conclusions and recommendations are valid only for the proposed construction.

As discussed previously, the subsurface conditions encountered in the borings were fairly consistent. However, the precise nature and extent of any subsurface variability may not become evident until construction. As a result, it is recommended that HBET provide construction materials testing and engineering oversight during the entire construction process.

It is important to note that the recommendations herein are intended to reduce the risk of structural movement and/or damage, to varying degrees, associated with volume change of the native soils. However, HBET cannot predict long-term changes in subsurface moisture conditions and/or the precise magnitude or extent of volume change. Where significant increases in shallow subsurface moisture occur due to poor grading, improper stormwater management, utility line failure, excess irrigation, or other cause, either during construction or the result of actions of the property owner, several inches of movement are possible.

In addition, any failure to comply with the recommendations in this report releases Huddleston-Berry Engineering & Testing, LLC of any liability with regard to the structure performance.

Huddleston-Berry Engineering and Testing, LLC is pleased to be of service to your project. Please contact us if you have any questions or comments regarding the contents of this report.

Respectfully Submitted:
Huddleston-Berry Engineering and Testing, LLC



Michael A. Berry, P.E.
Vice President of Engineering

FIGURES

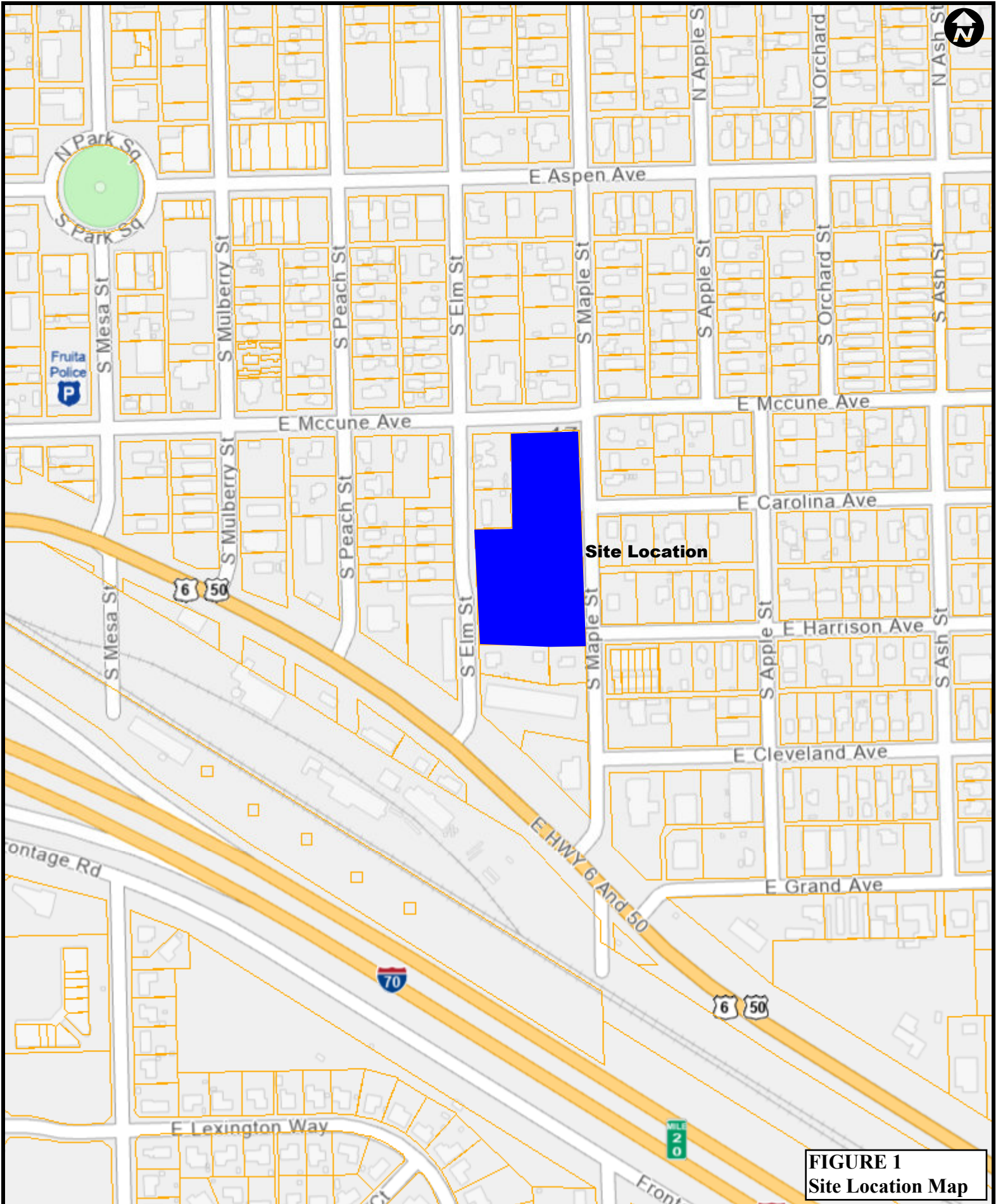
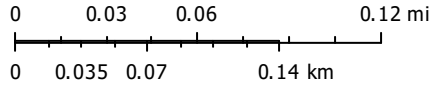


FIGURE 1
Site Location Map

Mesa County Map

The Geographic Information System (GIS) and its components are designed as a source of reference for answering inquiries, for planning and for modeling. GIS is not intended or does not replace legal description information in the chain of title and other information contained in official government records such as the County Clerk and Records office or the courts. In addition, the representations of location in this GIS cannot be substitute for actual legal surveys. The information contained herein is believed accurate and suitable for the limited uses, and subject to the limitations, set forth above. Mesa County makes no warranty as to the accuracy or suitability of any information contained herein. Users assume all risk and responsibility for any and all damages, including consequential damages, which may flow from the user's use of this information.



Print Date: November 2, 2022



Mesa County, Colorado

GIS/IT Department
gis.mesacounty.us

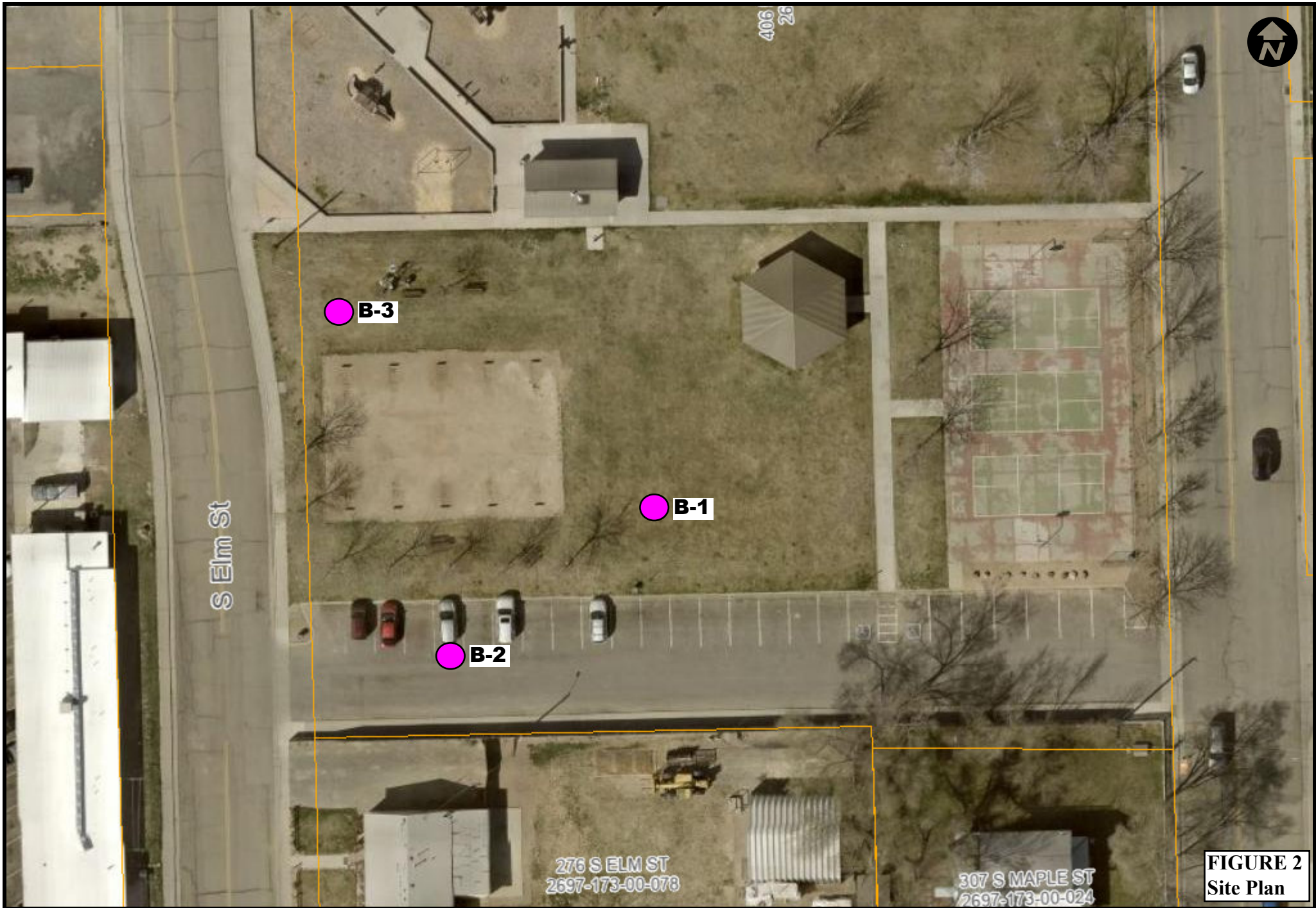
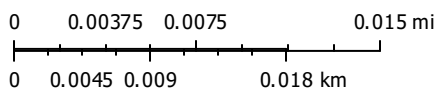


FIGURE 2
Site Plan

Mesa County Map

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Print Date: November 2, 2022



Mesa County, Colorado

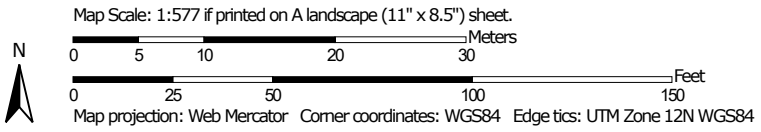
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APPENDIX A
Soil Survey Data

Soil Map—Mesa County Area, Colorado



Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mesa County Area, Colorado

Survey Area Data: Version 13, Sep 6, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 24, 2020—Jul 8, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Bc	Sagers silty clay loam, 0 to 2 percent slopes	1.6	100.0%
Totals for Area of Interest		1.6	100.0%

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named, soils that are similar to the named components, and some minor components that differ in use and management from the major soils.

Most of the soils similar to the major components have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Some minor components, however, have properties and behavior characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description

Mesa County Area, Colorado

Bc—Sagers silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: k0bq

Elevation: 4,490 to 5,900 feet

Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Sagers and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sagers

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Cretaceous source alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 12 inches: silty clay loam
C - 12 to 25 inches: silty clay loam
Cy - 25 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: C
Ecological site: R034BY106UT - Desert Loam (Shadscale)
Hydric soil rating: No

Data Source Information

Soil Survey Area: Mesa County Area, Colorado
Survey Area Data: Version 13, Sep 6, 2022

Dwellings and Small Commercial Buildings

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. This table shows the degree and kind of soil limitations that affect dwellings and small commercial buildings.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Report—Dwellings and Small Commercial Buildings

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Dwellings and Small Commercial Buildings—Mesa County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
Bc—Sagers silty clay loam, 0 to 2 percent slopes							
Sagers	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Shrink-swell	0.03	Shrink-swell	0.03	Shrink-swell	0.03

Data Source Information

Soil Survey Area: Mesa County Area, Colorado
Survey Area Data: Version 13, Sep 6, 2022

Soil Features

This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Report—Soil Features

Soil Features—Mesa County Area, Colorado									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		<i>Low-RV-High</i>	<i>Range</i>		<i>Low-High</i>	<i>Low-High</i>			
		<i>In</i>	<i>In</i>		<i>In</i>	<i>In</i>			
Bc—Sagers silty clay loam, 0 to 2 percent slopes									
Sagers		—	—		0	0	Moderate	Moderate	Moderate

Data Source Information

Soil Survey Area: Mesa County Area, Colorado

Survey Area Data: Version 13, Sep 6, 2022

APPENDIX B
Typed Boring Logs



Huddlestone-Berry Engineering & Testing, LLC
 2789 Riverside Parkway
 Grand Junction, CO 81501
 970-255-8005

BORING NUMBER B-1

PAGE 1 OF 1

CLIENT <u>City of Fruita</u>	PROJECT NAME <u>Reed Park Improvements</u>
PROJECT NUMBER <u>00207-0013</u>	PROJECT LOCATION <u>Fruita, CO</u>
DATE STARTED <u>9/28/22</u> COMPLETED <u>9/28/22</u>	GROUND ELEVATION _____ HOLE SIZE <u>4-inch</u>
DRILLING CONTRACTOR <u>S. McCracken</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>Simco 2000 Truck Rig</u>	▽ AT TIME OF DRILLING <u>6.5 ft</u>
LOGGED BY <u>TC</u> CHECKED BY <u>MAB</u>	▼ AT END OF DRILLING <u>6.5 ft</u>
NOTES _____	AFTER DRILLING <u>--</u>

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Lean CLAY with Sand and Organics (TOPSOIL)										
	▼	Lean CLAY with Sand (cl), brown, moist to wet, soft to medium stiff	SS 1	100	2-2-2 (4)							
5												
	▼		SS 2	100	0-1-2 (3)							
10												
	▼		SS 3	100	2-1-2 (3)							
15												
	▼		SS 4	100	4-4-4-3 (8)							
20		Silty SAND (sm), brown, wet, medium dense										
		Bottom of hole at 20.0 feet.										

GEOTECH\BH COLUMNS 00207-0013 REED PARK IMPROVEMENTS.GPJ GINT US LAB.GDT 11/2/22



Huddlestone-Berry Engineering & Testing, LLC
 2789 Riverside Parkway
 Grand Junction, CO 81501
 970-255-8005

BORING NUMBER B-2

PAGE 1 OF 1

CLIENT City of Fruita	PROJECT NAME Reed Park Improvements
PROJECT NUMBER 00207-0013	PROJECT LOCATION Fruita, CO
DATE STARTED 9/28/22 COMPLETED 9/28/22	GROUND ELEVATION _____ HOLE SIZE 4-inch
DRILLING CONTRACTOR S. McCracken	GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig	▽ AT TIME OF DRILLING 8.5 ft
LOGGED BY TC CHECKED BY MAB	▼ AT END OF DRILLING 8.5 ft
NOTES _____	AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		ASPHALT PAVEMENT										
		Granular BASE COURSE										
		Lean CLAY with Sand (cl), brown, moist to wet, very loose to stiff										
5												
			SS 1	56	3-6-4 (10)							
10												
			SS 2	72	1-1-1 (2)							
15												
		Silty SAND (sm), brown, wet, loose to medium dense	SS 3	100	3-5-4 (9)							
20												
			SS 4	83	4-4-3-2 (7)							
		Bottom of hole at 20.0 feet.										

GEOTECH BH COLUMNS 00207-0013 REED PARK IMPROVEMENTS.GPJ US LAB.GDT 11/2/22



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 Grand Junction, CO 81501
 970-255-8005

BORING NUMBER B-3

PAGE 1 OF 1

CLIENT City of Fruita	PROJECT NAME Reed Park Improvements
PROJECT NUMBER 00207-0013	PROJECT LOCATION Fruita, CO
DATE STARTED 9/28/22 COMPLETED 9/28/22	GROUND ELEVATION _____ HOLE SIZE 4-inch
DRILLING CONTRACTOR S. McCracken	GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig	▽ AT TIME OF DRILLING 8.5 ft
LOGGED BY TC CHECKED BY MAB	▼ AT END OF DRILLING 8.5 ft
NOTES _____	AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Lean CLAY with Sand and Organics (TOPSOIL)										
		Lean CLAY with Sand (cl), brown, moist to wet, very soft to medium stiff	SS 1	100	2-2-4 (6)							
5												
			SS 2	11	0-1-0 (1)							
10												
		Silty SAND (SM), brown, wet, loose **Lab Classified SS3	SS 3	100	1-2-3 (5)			25	NP	NP	NP	19
15												
			SS 4	25	1-2-3-3 (5)							
20		Bottom of hole at 20.0 feet.										

GEOTECH\BH COLUMNS 00207-0013 REED PARK IMPROVEMENTS.GPJ GINT US LAB.GDT 11/2/22

APPENDIX C
Laboratory Testing Results



Huddlestone-Berry Engineering & Testing, LLC
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 Grand Junction, CO 81501
 970-255-8005

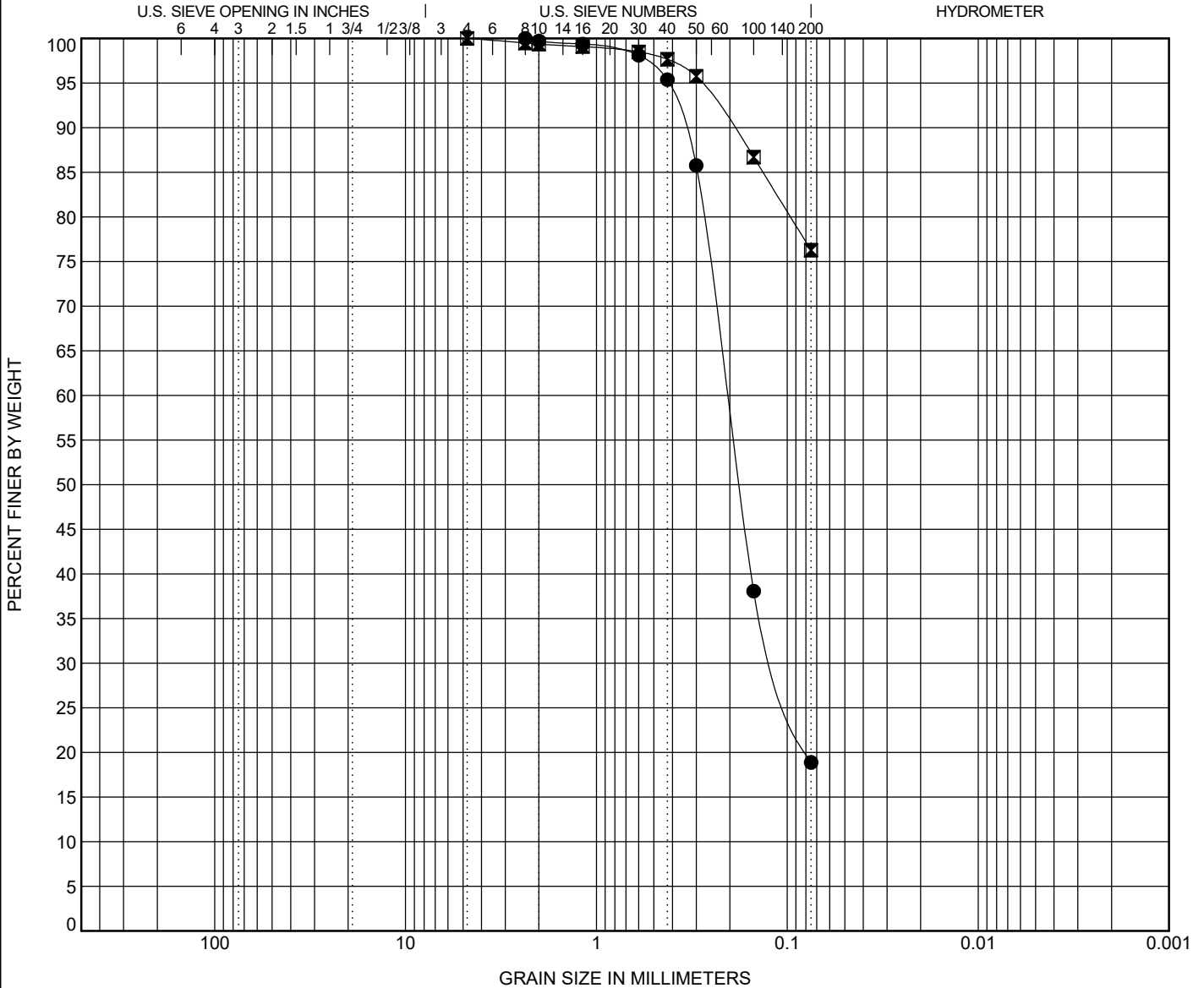
GRAIN SIZE DISTRIBUTION

CLIENT City of Fruita

PROJECT NAME Reed Park Improvements

PROJECT NUMBER 00207-0013

PROJECT LOCATION Fruita, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification					LL	PL	PI	Cc	Cu
● B-3, SS3 9/22	SILTY SAND(SM)					NP	NP	NP		
☒ Composite 9/22	LEAN CLAY with SAND(CL)					28	16	12		
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
● B-3, SS3 9/22	2.36	0.206	0.112		0.0	81.1	18.9			
☒ Composite 9/22	4.75				0.0	23.7	76.3			

GRAIN SIZE 00207-0013 REED PARK IMPROVEMENTS.GPJ GINT US LAB.GDT 11/2/22



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 970-255-8005

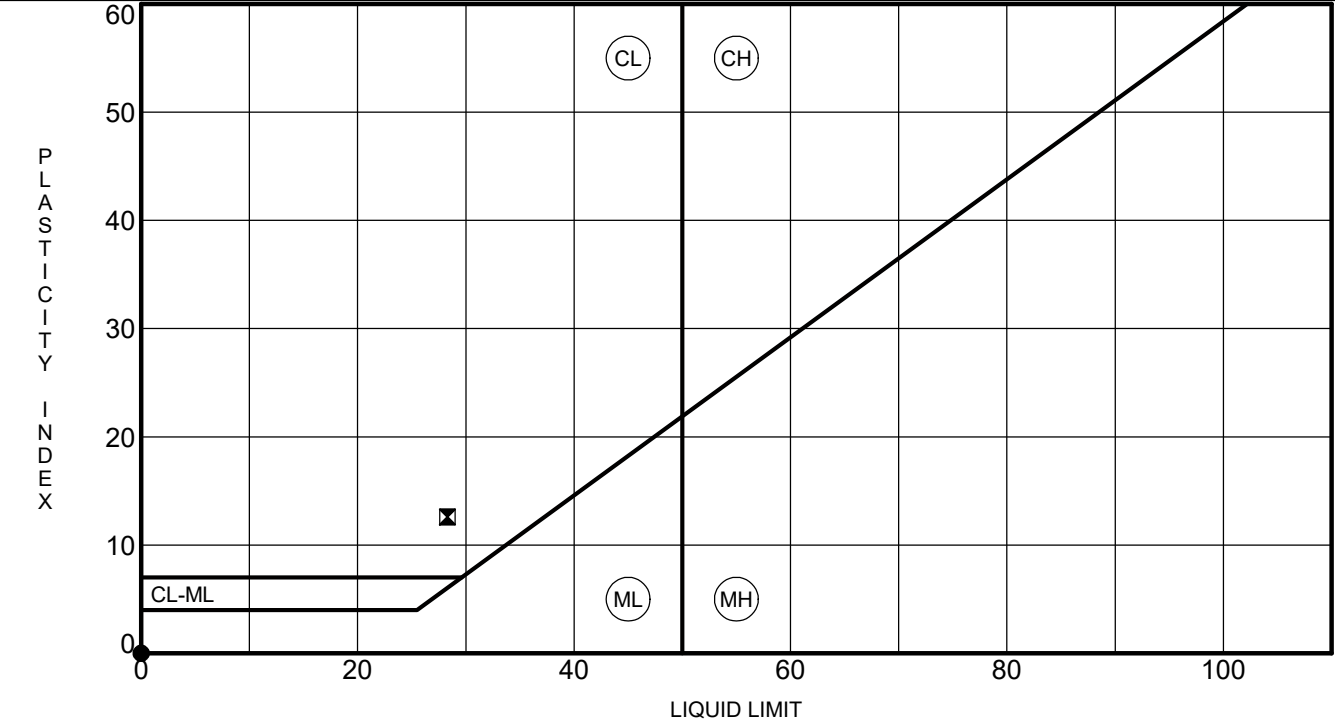
ATTERBERG LIMITS' RESULTS

CLIENT City of Fruita

PROJECT NAME Reed Park Improvements

PROJECT NUMBER 00207-0013

PROJECT LOCATION Fruita, CO



Specimen Identification	LL	PL	PI	#200	Classification
● B-3, SS3 9/28/2022	NP	NP	NP	19	SILTY SAND(SM)
☒ Composite 9/28/2022	28	16	12	76	LEAN CLAY with SAND(CL)

ATTERBERG LIMITS 00207-0013 REED PARK IMPROVEMENTS.GPJ GINT US LAB.GDT 11/2/22



Huddlestone-Berry Engineering & Testing, LLC
 2789 Riverside Parkway
 Grand Junction, CO 81501
 970-255-8005

MOISTURE-DENSITY RELATIONSHIP

CLIENT City of Fruita

PROJECT NAME Reed Park Improvements

PROJECT NUMBER 00207-0013

PROJECT LOCATION Fruita, CO

Sample Date: 9/28/2022
 Sample No.: 1
 Source of Material: Composite
 Description of Material: LEAN CLAY with SAND(CL)
 Test Method (manual): ASTM D698A

TEST RESULTS

Maximum Dry Density 112.5 PCF
 Optimum Water Content 15.0 %

GRADATION RESULTS (% PASSING)

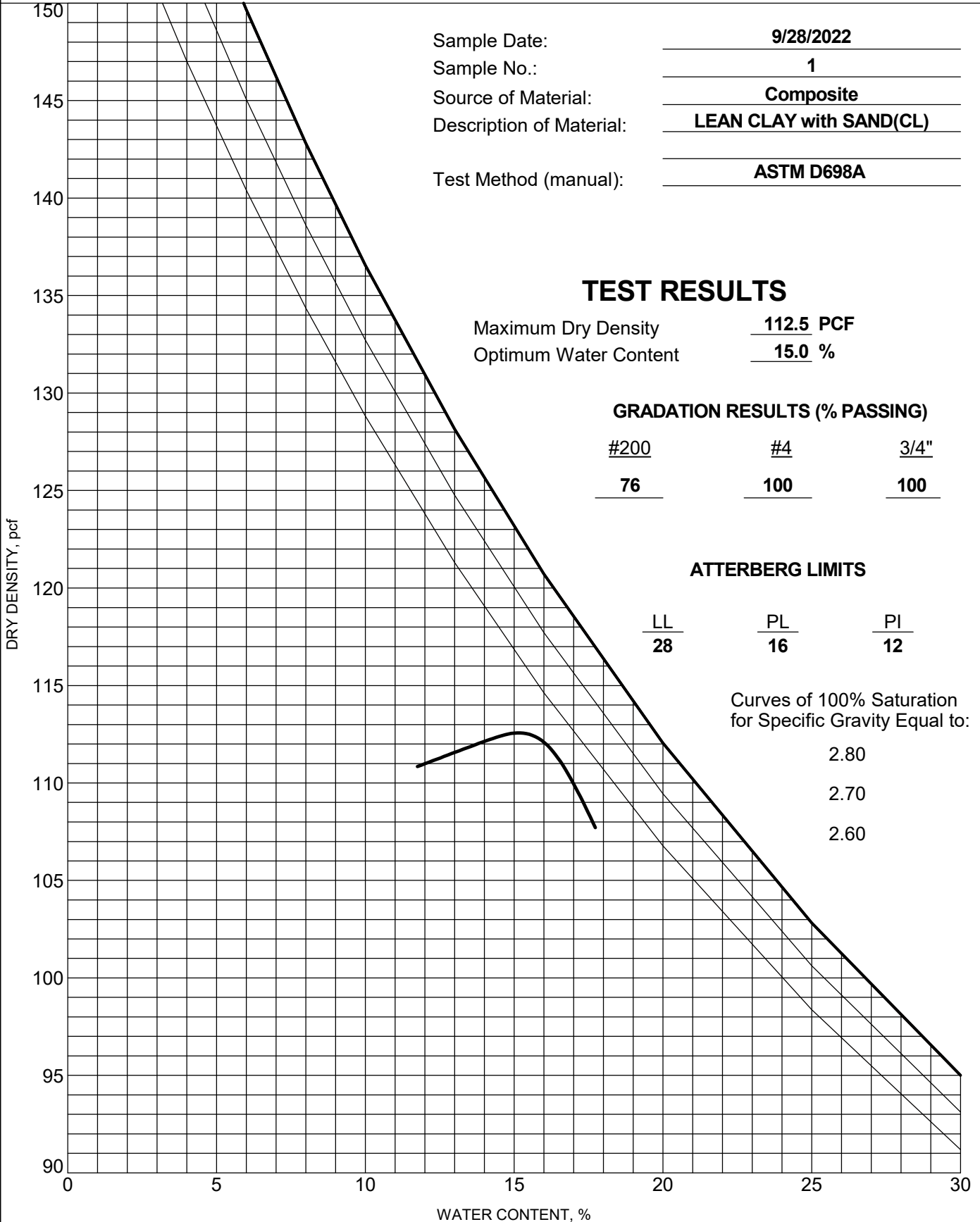
#200	#4	3/4"
<u>76</u>	<u>100</u>	<u>100</u>

ATTERBERG LIMITS

LL	PL	PI
<u>28</u>	<u>16</u>	<u>12</u>

Curves of 100% Saturation
 for Specific Gravity Equal to:

2.80
 2.70
 2.60





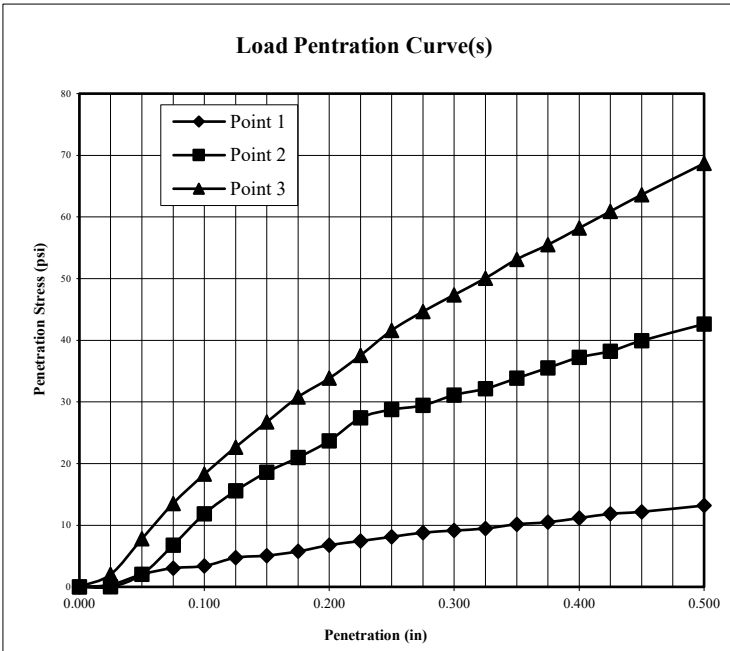
Project No.: 00207-0013
Project Name: Reed Park Improvements
Client Name: City of Fruita
Sample Number: 22-0854 **Location:** Composite

Authorized By: Client **Date:** 09/28/22
Sampled By: TC **Date:** 09/28/22
Submitted By: TC **Date:** 09/28/22
Reviewed By: MAB **Date:** 11/02/22

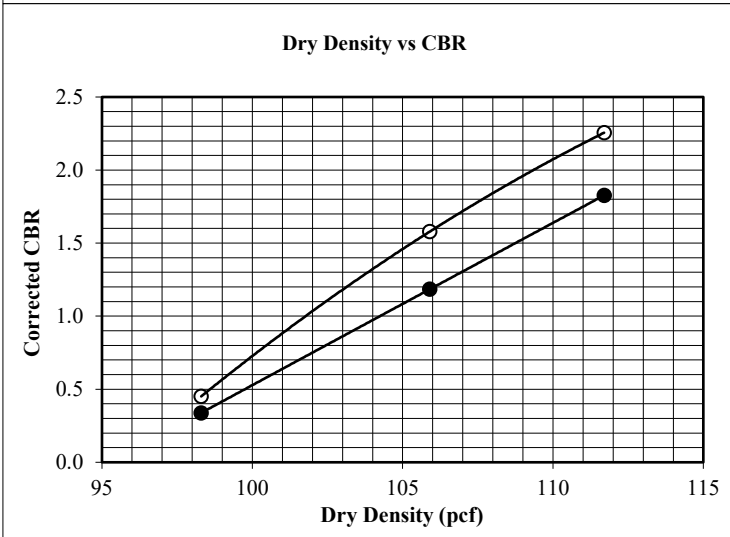
Compaction Method ASTM D698, Method A

Maximum Dry Density (pcf): 119.5
Opt. Moisture Content (%): 10.0
Sample Condition: Soaked
Remarks:

Sample Data			
	Point 1	Point 2	Point 3
Blows per Compacted Lift:	15	25	56
Surcharge Weight (lbs):	10.0	10.0	10.0
Dry Density Before Soak (pcf):	98.3	105.9	111.7
Dry Density After Soak (pcf):	96.9	104.6	110.0
Moisture Content (%)	Bottom Pre-Test	13.6	13.2
	Top Pre-Test	13.1	15.0
	Top 1" After Test	25.7	21.0
	Average After Soak:	23.2	19.5
Percent Swell After Soak:	1.4	1.2	1.5



Penetration Data								
Point 1			Point 2			Point 3		
Dist. (in)	Load (lbs)	Stress (psi)	Dist. (in)	Load (lbs)	Stress (psi)	Dist. (in)	Load (lbs)	Stress (psi)
0.000	0	0	0.000	0	0	0.000	0	0
0.025	1	0	0.025	0	0	0.025	6	2
0.050	6	2	0.050	6	2	0.050	23	8
0.075	9	3	0.075	20	7	0.075	40	14
0.100	10	3	0.100	35	12	0.100	54	18
0.125	14	5	0.125	46	16	0.125	67	23
0.150	15	5	0.150	55	19	0.150	79	27
0.175	17	6	0.175	62	21	0.175	91	31
0.200	20	7	0.200	70	24	0.200	100	34
0.225	22	7	0.225	81	27	0.225	111	38
0.250	24	8	0.250	85	29	0.250	123	42
0.275	26	9	0.275	87	29	0.275	132	45
0.300	27	9	0.300	92	31	0.300	140	47
0.325	28	9	0.325	95	32	0.325	148	50
0.350	30	10	0.350	100	34	0.350	157	53
0.375	31	10	0.375	105	36	0.375	164	55
0.400	33	11	0.400	110	37	0.400	172	58
0.425	35	12	0.425	113	38	0.425	180	61
0.450	36	12	0.450	118	40	0.450	188	64
0.500	39	13	0.500	126	43	0.500	203	69



Corrected CBR @ 0.1"		
0.3	1.2	1.8
Corrected CBR @ 0.2"		
0.5	1.6	2.3

Penetration Distance Correction (in)		
0.000	0.000	0.000

Figure: _____

City of Fruita

Department of Public Works
Engineering Division

Reed Park Improvements Project CIP Project #130-795-77-4730

8. Draft Contract

Reed Park Improvements Project

THIS CONTRACT is made this _____ day of _____, 2023 by and between the City of Fruita, herein after referred to as the "City" or "Owner", and *CONTRACTOR NAME HERE*, herein after referred to as the "Contractor".

RECITALS:

WHEREAS, the City desires to obtain services of a Contractor for the purpose of park, pedestrian and utility Improvements through property, rights-of-way and easements owned by the City of Fruita, and

WHEREAS, this Contract sets forth the Design, Special Provisions, Budget, and List of Submittals, herein after referred to as the "Project", and

WHEREAS, the Contractor is a licensed qualified construction contractor, capable of providing the professional services required, and

WHEREAS, the Contractor is willing and able to provide the Owner with these services, has negotiated acceptable pricing for the project consistent with the Scope of Services, and

NOW THEREFORE, in consideration of the terms of this contract, the parties agree as follows:

1. SCOPE OF SERVICES

- 1.1. The Contractor shall provide to the City the services for Reed Park Improvements Project defined by the Project Plans and Project Documents which include a Bid Schedule, Bid Instructions, Specifications, Special Provisions, and the 2009 City of Fruita Design Criteria and Construction Specifications Manual, by reference included herein, pursuant to the pricing, representations, and acknowledgements stated in the Contractor's Bid Schedule dated _____, 2023.
- 1.2. Such services shall include contracting for, coordinating, and scheduling other Contractors or sub-contractors as needed to accomplish the work described in the Project Plans, Contract Documents including the Specifications, Special Provisions and the Bid Schedule, irrespective of whether the work performed by these subcontractors are explicitly identified within the proposal.
- 1.3. All engineering work shall be completed by, or under the direct supervision of a Professional Engineer licensed in the State of Colorado.

- 1.4. Specific deliverables, and a schedule for these deliverables, are shown on the Construction Drawings or as described in The Specifications and Special Provisions.
- 1.5. In case of any conflict between the Contractor's representations and the Project Specifications, the Project Specifications shall control.
- 1.6. Contractor shall be responsible for insuring the safety of the public during the performance of the work, in accordance with the Manual on Uniform Traffic Control Devices and the requirements of the City, and for maintaining access through the area in which the work is to be performed, except as otherwise agreed to or excluded within the drawings, specifications, special provisions, or other contract documents.
- 1.7. The cost of the performance, payment and warranty bonds as described in Section 16.3.8 shall not exceed 2.5 percent of the amount set forth in Section 6.1.

2. DELIVERABLES AND SCHEDULE

- 2.1. All Deliverables shall be submitted to the City as specified in The Special Provisions.

3. COMPENSATION

- 3.1. The Contractor shall be compensated for the services defined in the Scope of Services according to the rate schedules provided by the City Of Fruita, attached hereto and incorporated herein by reference as Bid Schedule. Subcontracting expenses for other professional engineering services, specifically including geotechnical engineering services and surveying services shall be billed and paid at rates not exceeding the rates proposed and submitted by the Contractor. The Contractor is free to select sub consultants, but commits to billing rates not exceeding those submitted as part of the proposal process.
- 3.2. All rates shall be fixed at the rates shown on the Bid Schedule, throughout the original term of this Agreement.
- 3.3. Specific provisions concerning billing rates for travel time, direct costs, and other reimbursable items applicable to this project shall be billed at a rate as shown on the Bid Schedule.
- 3.4. The City agrees to pay, and Contractor agrees to accept, amount for the Scope of Services identified in this contract, as bid by the contractor in the amount of *cost in text* dollars and *cost cents* (\$XXX,XXX.XX).

- 3.5. With the approval of the City of Fruita, compensation for individual task items may exceed the proposed dollar amounts shown on the Bid Schedule, so long as the amount referenced is in the form of approved change orders with appropriate signatures by both parties of this contract.
- 3.6. Additional services or modifications of services and associated adjustments of compensation, which are within the scope of this project, shall be agreed to via a formal written Change Order by the Contractor and City of Fruita, and approved by the Fruita City Manager, (as may be required) prior to execution or performance of the Additional Services.
- 3.7. Material and/or labor costs that exceed the Bid Schedule, use of Alternate Bid Items, or other services / modifications shall be processed by Change Orders and approved by the City of Fruita prior to execution or performance of the Additional Services.
- 3.8. Payment under this Section by the Owner shall be due thirty (30) days from the date of receipt of invoice from the Contractor.

4. REPRESENTATION, DURATION, AND TERMINATION

- 4.1. In order to induce the City to enter into this Agreement, the Contractor makes the following representations:
 - 4.1.1. The Contractor has familiarized itself with the nature and the extent of the work, the locality, all physical characteristics of the area, including without limitation, improvements, soil conditions, drainage, topography, and all other features of the terrain, and with the local conditions and federal, state, and local laws, ordinances, rules, and regulations that in any manner may affect cost, progress, or performance of the work, or apply in any manner whatsoever to the work.
 - 4.1.2. Contractor has carefully considered all physical conditions at the site and existing facilities affecting cost, progress, or performance of the work.
 - 4.1.3. Contractor has given the City written notice of all conflicts, errors, or discrepancies that it has discovered in the contract documents and such documents are acceptable to the Contractor.
- 4.2. The Contractor accepts the relationship of trust and confidence established between it and the City by this Agreement. Contractor covenants with the City to furnish its best skill and judgment and to cooperate with the City's Project Manager and all other persons and entities in furthering the interests of the City.

Contractor agrees to furnish efficient business administration and superintendence and to use its best efforts to furnish at all times an adequate supply of workers and materials, and to perform the work in the best way and in the most expeditious and economical manner consistent with the interests of the City.

- 4.3. The City's Project Manager and point of contact for the purposes of this contract is the following or such other person as the City may designate in writing:

Sam Atkins, P.E.
City Engineer/Project Manager
325 E. Aspen Ave., Suite 155
Fruita, CO 81521
(970) 858-8377

5. TIME OF COMPLETION, LIQUIDATED DAMAGES, AND INCENTIVES FOR EARLY COMPLETION:

- 5.1. No work shall be commenced by the Contractor until after a pre-construction meeting of the Contractor, the City Engineer, and other City representatives as appropriate. All work shall be performed Monday through Friday, during daylight hours only, except as agreed to in writing by the City.
- 5.2. Prompt completion of the work is essential to the City. Time is of the essence in all respects regarding this Agreement and the work. Contractor shall carry out construction of the project with all due diligence in compliance with the schedule submitted at the beginning of the project. Depending on subcontractor availability, if needed, the date of final completion of skate/wheel park construction can be extended after **June 1, 2024**, subject to the City Project Manager's discretion.

Substantial completion of the work shall be defined by the date in which all deliverables have been accepted and the contractor has completed construction.

Project Final Completion is defined as the Date of Signature of City Engineering on the Notice of Final Acceptance and Warranty of the design phase. Date of Final Completion shall be by **June 15, 2024**, including the installation and testing of all drainage, sewer, irrigation, sidewalk and pavement improvements, as well as final project cleanup, contractor demobilization and removal of any and all traffic control devices. Depending on subcontractor availability, if needed, the date of final completion of skate/wheel park construction can be extended after June 15, 2024, subject to the City Project Manager's discretion.

5.3. Liquidated Damages. The City and Contractor agree there **will not** be liquidated damages assessed on this project. When weather conditions exist such that the Contractor cannot reasonably perform work activities for a given day, the contract time will be extended.

5.4. Incentive for Early Completion It is in the best interest of the Contractor to complete the work as early as possible, however there **will not** be any monetary incentive for early completion.

6. PRICE OF WORK.

6.1. The City agrees to pay, and Contractor agrees to accept, in full payment for the performance of this Agreement, *Written Cost Here* dollars and *Cost cents* (\$XXX, XXX.XX).

6.2. The amount set forth in Section 6.1 above shall not include the following: costs of delays, rework, overruns, and/or other costs specifically excluded by the drawings, specifications, or other bid documents;

7. SCOPE OF PAYMENT.

7.1. The Contractor shall accept the compensation, as herein provided, in full payment for furnishing all materials, equipment, labor, tools, and incidentals necessary to complete the work and for performing all work contemplated and embraced under this Agreement. Compensation shall also include loss or damage caused by the nature of the work, the action of the elements, or any unforeseen difficulties which may be encountered during the prosecution of the work, for all expenses incurred in consequence of the suspension or discontinuance of the work as herein specified, and for any infringement of patent, trademark, or copyright. Compensation shall be for completing the work according to the contract documents. Neither the payment of any estimate or progress payment nor the payment of any retained percentage shall relieve the Contractor of any obligations to correct any defective work or material. No funds, payable under this Agreement or any part thereof, shall become due and payable, if the City so elects, until the Contractor shall satisfy the City that it has fully settled or paid for all materials and equipment used in or upon the work and labor done in connection therewith. The City may pay any or all such claims or bills, wholly or in part, and deduct the amount or amounts so paid from any funds due Contractor. In the event the surety on any contract, performance bond, payment bond, or warranty bond given by the Contractor becomes insolvent, or is placed in the hands of a receiver, or has its right to do business in the state revoked, the City may withhold payment of funds due Contractor until the Contractor has provided a bond or other security to the satisfaction of the City in lieu of the bond so executed by such surety.

8. PROGRESS PAYMENTS AND RETAINAGE.

- 8.1. By the 5th day of each month, Contractor shall submit to the City for review and approval, an application for payment fully completed and signed by Contractor covering the work completed through the last day of the prior month and accompanied by such supporting documentation as is required by these contract documents, including without limitation, time sheets, invoices, receipts, bills of lading, and all other documents the City may require. Materials on hand but not complete in place may not be included for payment at the discretion of the City. Each subsequent application for payment shall include an affidavit of Contractor providing that all previous progress payments received on account of the work have been applied to discharge in full all of Contractor's obligations reflected in prior applications for payment.
- 8.2. Retainage shall be withheld from a contract exceeding fifty thousand dollars. Notwithstanding the progress payments, it is the intent and purpose of the City to withhold at least five percent (5%) of the contracted amount deducted from each payment to the Contractor as retainage in accordance with Article 91, Title 24, C.R.S.

9. OWNERSHIP OF PLANS, SPECIFICATIONS, AND DOCUMENTS.

- 9.1. Except for Contractor's executed set, all of the plans and the contract documents are the property of the City. Contractor shall be provided plans, specifications, permits, and other documents and materials required to perform the work. The plans and specifications are not to be used on other work, and all sets shall be returned to City at the completion or cessation of the work or termination of this Agreement.

10. NO PERSONAL LIABILITY.

- 10.1. In carrying out any of the provisions of this Agreement or in exercising any power or authority thereby, there shall be no personal liability of the City, its governing body, staff, consultants, officials, attorneys, representatives, agents, or employees.

11. OBSERVATION OF ALL LAWS.

- 11.1. It is assumed that Contractor is familiar with all federal, state, and local laws, codes, ordinances, and regulations which in any manner affect those engaged or employed in the work or the material or equipment used in or upon the site or in any way affect the conduct of the work or construction of the project. No pleas or claims of misunderstanding or ignorance by Contractor shall in any way serve to modify the provisions of the Agreement. Contractor shall at all times observe and comply with all federal, state, county, local, and municipal

laws, codes, ordinances, and regulations in any manner affecting the conduct of the work or the project. It is not the responsibility of Contractor to determine that this Agreement and the contract documents are in accordance with applicable laws, statutes, building codes, and regulations; however, if Contractor knows, or should have reason to know, that any of the contract documents are at variance therewith in any respect, Contractor shall promptly notify the City in writing, and any necessary changes shall be made as provided herein.

12. AGREEMENT PROVISIONS PREVAIL.

12.1. The intent and purpose of this Agreement and the construction documents is to complement each other; however, the terms and provisions of this Agreement shall prevail regarding differences in, discrepancies with, or conflicts of, terms or provisions contained in other contract documents.

13. CONTRACTOR'S RESPONSIBILITY FOR WORK.

13.1. Until the final acceptance of the work by the City in writing, Contractor shall have the charge and care thereof, and shall take every necessary precaution against injury or damage to any part thereof by the effects of the elements or from any other cause. Contractor, at its own expense, shall rebuild, repair, restore, and correct all injuries or damages to any portion of the work occasioned by any causes before its completion and acceptance. In case of suspension of work from any cause whatsoever, Contractor shall be responsible for all materials and shall properly store same, if necessary, and shall provide suitable drainage, barricades, and warning signs where necessary. Contractor shall correct or replace, at its own expense and as required by City, any material which may be destroyed, lost, damaged, or in any way made useless for the purpose and use intended by the contract documents, plans, and specifications prior to final acceptance of the work, or portions thereof. Contractor shall be relieved of the responsibilities provided in this section upon final acceptance of the work by City, except no such relief shall apply to damages or injuries caused by or related to actions of Contractor or its subcontractors.

14. TERMINATION OF CONTRACTOR'S RESPONSIBILITY.

14.1. The project will be considered complete when all work has been finished, the final inspection made, and the work accepted by City in writing, and all claims for payment of labor, materials, or services of any kind used in connection with the work thereof have been paid or settled by Contractor or its surety. Contractor will then be released from further obligation except as set forth in the surety bond, and except as required in this Agreement and the contract documents regarding the Contractor's guaranty of work.

15. INDEMNIFICATION

15.1. To the fullest extent permitted by law, the Contractor agrees to indemnify and hold harmless the City, and its officers and its employees, from and against all liability, claims, and demands, on account of any injury, loss, or damage, which arise out of or are connected with the Work, if such injury, loss, or damage, or any portion thereof, is caused by, or claimed to be caused by, the act, omission, or other fault of the Contractor or any subcontractor of the Contractor, or any officer, employee, or agent of the Contractor or any subcontractor, or any other person for whom Contractor is responsible. The Contractor shall investigate, handle, respond to, and provide defense for and defend against any such liability, claims, and demands, and to bear all other costs and expenses related thereto, including court costs and attorneys' fees. The Contractor's indemnification obligation shall not be construed to extend to any injury, loss, or damage which is caused by the act, omission, or other fault of the City.

16. INSURANCE AND BONDS

16.1. The Contractor shall not commence work under this Agreement until it has obtained all insurance required by the contract documents and such insurance has been approved by City. The Contractor shall not allow any subcontractor to commence work on this project until all similar insurance required of the subcontractor has been obtained and approved. For the duration of this Agreement, the Contractor must maintain the insurance coverage required in this section.

16.2. The Contractor agrees to procure and maintain, at its own cost, the following policy or policies of insurance. The Contractor shall not be relieved of any liability, claims, demands, or other obligations assumed pursuant to the contract documents by reason of its failure to procure or maintain insurance, or by reason of its failure to procure or maintain insurance in sufficient amounts, durations, or types.

16.3. Contractor shall procure and maintain, and shall cause each Subcontractor of the Contractor to procure and maintain (or shall insure the activity of Contractor's Subcontractors in Contractor's own policy with respect to), the minimum insurance coverages listed below. Such coverages shall be procured and maintained with forms and insurers acceptable to the City. All coverages shall be continuously maintained from the date of commencement of the Work. In the case of any claims-made policy, the necessary retroactive dates and extended reporting periods shall be procured to maintain such continuous coverage.

16.3.1. Workers' Compensation insurance to cover obligations imposed by the Workers' Compensation Act of Colorado and any other applicable laws

for any employee engaged in the performance of Work under this contract, and Employers' Liability insurance with minimum limits of FIVE HUNDRED THOUSAND DOLLARS (\$500,000) each accident, FIVE HUNDRED THOUSAND DOLLARS (\$500,000) disease - policy limit, and FIVE HUNDRED THOUSAND DOLLARS (\$500,000) disease - each employee.

- 16.3.2. Comprehensive General Liability insurance with minimum combined single limits of ONE MILLION DOLLARS (\$1,000,000) each occurrence and ONE MILLION DOLLARS (\$1,000,000) aggregate. The policy shall be applicable to all premises and operations. The policy shall include coverage for bodily injury, broad form property damage (including completed operations), personal injury (including coverage for contractual and employee acts), blanket contractual, independent contractors, products, and completed operations. The policy shall include coverage for explosion, collapse, and underground hazards. The policy shall contain a severability of interests provision.
- 16.3.3. Comprehensive Automobile Liability insurance with minimum combined single limits for bodily injury and property damage of not less than ONE MILLION DOLLARS (\$1,000,000) each occurrence and ONE MILLION DOLLARS (\$1,000,000) aggregate with respect to each of Contractor's owned, hired and/or non-owned vehicles assigned to or used in performance of the services. The policy shall contain a severability of interests provision.
- 16.3.4. The policies required above, except for the Workers' Compensation insurance and Employers' Liability insurance, shall be endorsed to include the City, and its officers and employees, as additional insureds. Every policy required above shall be primary insurance, and any insurance carried by the City, its officers, or its employees, shall be excess and not contributory insurance to that provided by Contractor. The additional insured endorsement for the Comprehensive General Liability insurance required above shall not contain any exclusion for bodily injury or property damage arising from completed operations. The Contractor shall be solely responsible for any deductible losses under each of the policies required above.
- 16.3.5. Certificates of insurance shall be completed by the Contractor's insurance agent as evidence that policies providing the required coverages, conditions, and minimum limits are in full force and effect, and shall be subject to review and approval by the City. Each certificate shall identify the Project and shall provide that the coverages afforded under the policies shall not be canceled, terminated or materially changed until at least 30 days prior written notice has been given to the

City. If the words "endeavor to" appear in the portion of the certificate addressing cancellation, those words shall be stricken from the certificate by the agent(s) completing the certificate. The City reserves the right to request and receive a certified copy of any policy and any endorsement thereto.

- 16.3.6. Failure on the part of the Contractor to procure or maintain policies providing the required coverages, conditions, and minimum limits shall constitute a material breach of contract upon which the City may immediately terminate the contract, or at its discretion may procure or renew any such policy or any extended reporting period thereto and may pay any and all premiums in connection therewith, and all monies so paid by the City shall be repaid by Contractor to the City upon demand, or the City may offset the cost of the premiums against any monies due to Contractor from the Owner.
- 16.3.7. The parties hereto understand and agree that the City is relying on, and does not waive or intend to waive by any provision of this contract, the monetary limitations (presently \$150,000 per person and \$600,000 per occurrence) or any other rights, immunities, and protections provided by the Colorado Governmental Immunity Act, ' 24-10-101 et seq., 10 C.R.S., as from time to time amended, or otherwise available to the City, its officers, or its employees.
- 16.3.8. For all contracts exceeding \$50,000 in value, Contractor shall furnish a performance and payment bond, at least equal to the contract price, as security for the faithful performance and payment of all Contractor's obligations under the contract documents. Contractor shall also furnish a cash warranty or warranty bond in an amount equal to ten percent of the final Contract value, which shall remain in effect for the duration of the guaranty period provided in Section 19. At the Contractors option, the Performance and Payment bonds may be rolled over and substituted for the Warranty Bond, so long as these bonds remain in effect for the duration of the guaranty period provided in Section 19. If a cash warranty is provided, said cash shall be deposited with the City Clerk during the guaranty period provided in Section 19. All bonds shall be in the forms prescribed by the contract documents and be executed by such sureties as (i) are licensed to conduct business in the State of Colorado and (ii) are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570, amended, by the Audit Staff, Bureau of Account, U.S. Treasury Department. All bonds signed by an agent must be accompanied by a certified copy of the authority to act. If the surety on any bond furnished by the Contractor is declared bankrupt or becomes insolvent, or its right

to do business in Colorado is terminated, or it ceases to meet the requirements of clauses (i) and (ii) of this section, Contractor shall, within five (5) days thereafter, substitute another bond and surety, both of which shall be acceptable to the City.

17. EVIDENCE OF SATISFACTION OF LIENS.

17.1. Contractor shall provide City with written evidence that all persons who have done work or furnished material under this Agreement and are entitled to liens therefore under any laws of the State of Colorado have been fully paid or are not entitled to such liens. Final payment shall not be made to Contractor until the City is reasonably satisfied that all claims or liens have been satisfied by Contractor.

18. ACCEPTANCE OF WORK.

18.1. No act of the City, or of any representative thereof, either in superintending or directing the work, or any extension of time for the completion of the work, shall be regarded as an acceptance of such work or any part thereof, or of materials used therein, either wholly or in part. Acceptance shall be evidenced only by the Notice of Final Acceptance and Warranty issued by the City. No waiver of any breach of this contract by City or anyone acting on their behalf shall be held as a waiver of any other subsequent breach thereof. Any remedies provided herein shall be cumulative.

19. GUARANTY OF WORK.

19.1. Contractor agrees to guaranty all work under this Agreement for a period of one year from the date of final acceptance by the City. If any unsatisfactory condition or damage develops within the time of this guaranty due to materials or workmanship that are defective, inferior, or not in accordance with the Agreement, as reasonably determined by City, then the Contractor shall, when notified by City, immediately place such guaranteed work in a condition satisfactory to City. The City shall have all available remedies to enforce such guaranty, except that City shall not have any work performed independently to fulfill such guaranty and require Contractor to pay City such sums as were expended by the City for such work, unless the City has first given notice to the Contractor of the deficiency and given the Contractor a reasonable opportunity to cure the same.

20. DEFAULT / BREACH OF CONTRACT.

20.1. If the Contractor fails to mobilize to the job site, fails to perform work in a continuous and timely manner, performs Work in a manner substantially contrary to the specifications and design drawings, performs additional work without a valid change order or other authorization, performs Force Account work without authorization, fails to obtain necessary permits, is found in violation of any State or Federal environmental law, or fails to maintain a safe work environment, the City may, at its sole option and discretion, find the Contractor in Default and material Breach of this Contract. In such instances, the City shall document to the Contractor the nature of the Breach, and may, at its option, specify a remedy and required timeframe in which to cure the Breach, or may terminate the Contract. If the City chooses to terminate the Contract, the City reserves and retains all rights granted under State Law, and City Ordinances, to withhold payments for completed work, call bonds, hire replacement Contractors, or take other measures deemed in the best interest of the City.

21. FINAL APPLICATION FOR PAYMENT.

21.1. After Contractor has completed all such corrections to the satisfaction of Project Manager and delivered in accordance with the Contract Documents all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance required by the Contract Documents, certificates of inspection, marked-up record documents, and other documents, Contractor may make application for final payment following the procedure for progress payments. The final application for payment shall be accompanied (except as previously delivered) by:

- i. All documentation called for in the Contract Documents, including but not limited to the evidence satisfactory to the City of the continuation of completed operations insurance and any insurance coverage written on a claims-made basis at final payment and one year thereafter;
- ii. The consent of surety to final payment and that the performance bond shall remain in effect throughout the guarantee period;
- iii. Complete and legally effective claim releases signed by all suppliers and subcontractors in the form provided in the Contract Documents certifying that all outstanding claims for payment have been paid. The Contractor shall not receive final payment due under the Agreement until the Contractor obtains and files the foregoing items (i), (ii), and (iii).

21.2. **LIENS:** Colorado Statutes do not provide for any right of lien against public facilities. In lieu thereof, ' 38-26-107, Colorado Revised Statutes, as amended,

provides adequate relief for any claimant having furnished labor, materials, rental machinery, tools, equipment, or services toward construction of the particular public work in that final payment may not be made to a Contractor until all such creditors have been put on notice by publication of such pending payment and given opportunity to stop payment to the Contractor in the amount of such claims. Pursuant to ' 38-26-107, C.R.S., any supplier may bring a suit and file a notice of lis pendens against the City within ninety (90) days after the date set for final settlement. If any such supplier or person files any such claim and notice of lis pendens, the City shall withhold retained amounts from final payments to the Contractor as are necessary to satisfy fully such claims. References to liens appearing in this Article shall be deemed as references to claims made pursuant to C.R.S ' 38-26-101 et seq. unless the context requires otherwise.

22. FINAL PAYMENT AND ACCEPTANCE.

22.1. If, on the basis of Project Manager's observation of the Work during construction and final inspection, and Project Manager's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Project Manager is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Project Manager will, within FOURTEEN days after receipt of the final Application for Payment, indicate in writing Project Manager's recommendation of payment and present the Application to the City Council for payment. At the same time Project Manager will also give written notice to Contractor that the Work is acceptable. Otherwise, Project Manager will return the Application to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application. Upon receipt of the Project Manager's recommendation for payment and the final Application for Payment, the City shall order the publication of Notice of Final Payment as required by C.R.S. ' 38-26-107(1) and shall make final payment in accordance with C.R.S. ' 38-26-107(3).

23. DELAYED COMPLETION.

23.1. If, through no fault of Contractor, final completion of the Work is significantly delayed and if Project Manager so confirms, the City shall, upon receipt of Contractor's final Application for Payment and recommendation of Project Manager, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by the City for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required by the Contract Documents, the written consent of the surety to the payment of the balance due for that portion of the

Work fully completed and accepted shall be submitted by Contractor to Project Manager with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

24. COSTS AND ATTORNEY'S FEES.

24.1. In addition to the indemnification provisions of this Agreement and the contract documents, and provided that the City is not in material default of this Agreement or the direct cause of litigation, the Contractor shall be responsible for and pay the City for all of the costs, expenses, and attorneys' fees "including legal assistants fees" related to litigation or other forms of dispute resolution arising out of any matter related to this Agreement, the contract documents, including performance and payment bonds, or the work.

25. CHANGE ORDERS.

25.1. The City shall use reasonable efforts to grant or deny change orders within twenty-four hours and not later than seventy-two hours of request of the Contractor. The Project Manager shall be authorized to approve individual change orders which do not exceed \$10,000.00. Any change orders which increase the price of the work above \$10,000.00 shall be approved by the City Manager.

Change Orders must be processed and approved by the City before additional materials, equipment, and / or labor are expended.

26. NO ASSIGNMENT.

26.1. This Agreement shall not be assigned by the Contractor without the prior written approval of the City.

27. GOVERNING LAW.

27.1. This Agreement shall be deemed entered into in Mesa County, Colorado, and shall be governed by the laws of the State of Colorado. The parties agree to the jurisdiction and venue of the courts of Mesa County in connection with any dispute arising out of or in any matter connected with this Agreement.

28. SUBCONTRACTING.

28.1. It is understood and agreed that the employment of the Contractor by the City for the purposes of said project shall be exclusive, but the Contractor shall have the right to employ such assistance as may be required for the performance of

the project. Said Contractor shall be responsible for the compensation, insurance, and all clerical detail involved in the employment of said assistance.

29. EQUAL OPPORTUNITY EMPLOYER.

- 29.1. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, age, sex, disability or national origin. The Contractor will take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard to their race, color, religion, age, sex, disability, or national origin. Such action shall include but not be limited to the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notice to be provided by an agency of the federal government, setting forth the provisions of the Equal Opportunity Laws.
- 29.2. The Contractor shall be in compliance with the appropriate provisions of the American with Disabilities Act of 1990 as enacted and from time to time amended and any other applicable federal regulation. A signed, written certificate stating compliance with the Americans with Disabilities Act may be requested at any time during the life of any purchase order or contract and with any new purchase order or contract issued by the City.

30. INDEPENDENT CONTRACTOR.

- 30.1. Contractor and any persons employed by Contractor for the performance of work hereunder shall be independent contractors and not employees or agents of the City. Nothing herein shall be construed as establishing a quality standard for any individual, or as establishing any right on the part of the City to oversee the actual work of the Contractor or to instruct any individual as to how the work will be performed.
- 30.2. Contractor shall have the right to employ such assistance as may be required for the performance of work under this Agreement. Said Contractor shall be responsible for the compensation, insurance, and all clerical detail pertaining to such assistants, and shall be solely responsible for providing any training, tools, benefits, materials, and equipment.
- 30.3. THE PARTIES HERETO UNDERSTAND THAT THE CONTRACTOR AND THE CONTRACTOR'S EMPLOYEES AND SUBCONTRACTORS ARE NOT ENTITLED TO WORKERS' COMPENSATION BENEFITS UNDER ANY WORKERS' COMPENSATION INSURANCE POLICY OF THE CITY, AND THAT CONTRACTOR IS OBLIGATED TO PAY FEDERAL AND STATE

INCOME TAX AND OTHER APPLICABLE TAXES AND OTHER AMOUNTS
DUE ON ANY MONEYS PURSUANT TO THIS AGREEMENT.

31. Illegal alien addendum required in all public contracts for services by house bill 06-1343, enacted by the Colorado General Assembly AND APPROVED BY THE GOVERNOR ON JUNE 6, 2006.

- 31.1. By its signature on this Agreement, Contractor certifies that, as of the time of its signature, it does not knowingly employ or contract with an illegal alien and that, in order to verify that it does not employ any illegal aliens, the Contractor has participated or attempted to participate in the e-verify program ("Basic Pilot Program") created in Public Law 208, 104th Congress, as amended, and expanded in Public Law 156, 108th Congress, as amended, administered by the United States Department of Homeland Security.
- 31.2. Contractor agrees that it shall not knowingly employ or contract with an illegal alien to perform work under this Agreement; and that it shall not enter into a contract with a subcontractor that fails to certify to the contractor that the subcontractor shall not knowingly employ or contract with an illegal alien to perform work under this contract.
- 31.3. Contractor has verified or attempted to verify through participation in the Basic Pilot Program that the Contractor does not employ any illegal aliens. If Contractor has not been accepted into the Basic Pilot Program prior to entering into this Agreement, Contractor shall apply to participate in the Basic Pilot Program every three months until the Contractor is accepted or work under this Agreement has been completed, whichever is earlier. This requirement shall not apply if the Basic Pilot Program is discontinued.
- 31.4. Contractor shall not use Basic Pilot Program procedures to undertake pre-employment screening of job applicants while work under this Agreement is being performed.
- 31.5. If Contractor obtains actual knowledge that a subcontractor performing work under this Agreement knowingly employs or contracts with an illegal alien, the Contractor shall: (1) notify the subcontractor and the Owner within three days that the Contractor has actual knowledge that the subcontractor is employing or contracting with an illegal alien; and (2) terminate the subcontract with the subcontractor if, within three days of receiving the notice required herein, the subcontractor does not stop employing or contracting with the illegal alien; except that the Contractor shall not terminate the contract with the subcontractor if during such three days the subcontractor provides information to establish that the subcontractor has not knowingly employed or contracted with an illegal alien.

- 31.6. The Contractor shall comply with any reasonable request by the Colorado Department of Labor and Employment made in the course of an investigation that the Department is undertaking pursuant to the authority established in C.R.S. section 8-17.5-101(5).
- 31.7. If Contractor violates a provision of this Illegal Alien Addendum, the Owner may terminate this Agreement for breach of contract. If the Agreement is so terminated, the Contractor shall be liable for actual and consequential damages to the Owner. Contractor understands that, in the event of such a termination, Owner is required to notify the office of the Colorado Secretary of State.

DRAFT

By their signatures, the parties agree to the terms of this Agreement this

_____ day of _____, 20_____.

CITY OF FRUITA, OWNER

By _____
Michael Bennett
City Manager

Attest: _____
Margaret Sell
City Clerk

Contractor name here, CONTRACTOR

By: _____ Title: _____

ACKNOWLEDGEMENT

STATE OF COLORADO)
)ss
COUNTY OF MESA)

The above and foregoing signature of _____ was subscribed
and sworn before me

this _____ day of _____, 2022.

Witness my hand and official seal.

My commission expires of: _____

(SEAL)

Notary Public

Address

City of Fruita

Department of Public Works
Engineering Division

Reed Park Improvements Project CIP Project #130-795-77-4730

9. Bid Schedule

**City of Fruita
Bid Schedule**

Reed Park Improvements Project

<u>No.</u>	<u>Referenced Spec. Section</u>	<u>Item</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Extension</u>
1	Special Prov.	Mobilization & Demobilization	LS	1		
2	Special Prov.	Construction Surveying	LS	1		
3	Special Prov.	Material Testing	LS	1		
4	312270	Temp. Erosion and Sedimentation Control/Stormwater Mgmt.	LS	1		
5	Special Prov.	Traffic Control	LS	1		
6	311000	Site Clearing	LS	1		
7	312000	Earth Moving	LS	1		
8	Special Prov.	Remove/Dispose of Existing Asphalt (Full-Depth)	SY	70		
9	Special Prov.	Remove/Dispose of Existing Concrete (Includes Wall)	SF	7000		
9A	Special Prov.	Remove/Dispose of Existing Concrete (Add Alternate)	SF	900		
10	Special Prov.	Remove/Dispose of Existing Planting Area	SF	17000		
10A	Special Prov.	Remove/Dispose of Existing Planting Area (Add Alternate)	SF	7100		
11	Special Prov.	Remove/Dipose of Existing Tree	Each	8		
11A	Special Prov.	Remove/Dipose of Existing Tree (Add Alternate)	Each	3		
12	Special Prov.	Remove/Dispose of Existing Bathroom Facility/Foundation	LS	1		
13	Special Prov.	Remove/Dispose of Existing Playground Equipment	LS	1		
14	Special Prov.	Remove/Salvage Merry-Go-Round	LS	1		
15	Special Prov.	Remove/Dispose of Existing Playground Mulch	LS	1		
16	Special Prov.	Cap/Remove/Abandon Existing Gas Service	LS	1		
17	Special Prov.	Cap/Remove/Abandon Existing Water Tap/Line/Meter	LS	1		
18	Special Prov.	Cap/Remove/Abandon Existing Sewer Service Line	LS	1		
19	Special Prov.	Remove/Dispose of Existing Horseshoe Pits	LS	1		
20	Special Prov.	Remove/Fill Existing Drain Sump	LS	1		
21	Special Prov.	Remove/Dispose of Existing Water Fountain	LS	1		
22	Special Prov.	Remove/Dispose of Existing Chain Link Fence	LF	130		
23	329300	Catalpa speciosa (Western Catalpa)	Each	4		
23A	329300	Catalpa speciosa (Western Catalpa) (Add Alternate)	Each	1		
24	329300	Morus alba 'fruitless' (Fruitless Mulberry)	Each	4		
25	329300	Comus sericea (Red Twig Dogwood)	Each	73		
26	329300	Boeteloua gracilis (Blue Grama)	Each	616		
26A	329300	Boeteloua gracilis (Blue Grama) (Add Alternate)	Each	376		
27	329300	Nepeta 'Little Trudy' (Catmint 'Little Trudy')	Each	80		
28	329300	Perovskia atriplicifolia (Russian Sage)	Each	233		
28A	329300	Perovskia atriplicifolia (Russian Sage) (Add Alternate)	Each	68		
29	329200	Buffalo Brand Dura- Turf Plus	SF	8372		
30	015639	Temporary Tree and Plant Protection	LS	1		
30A	015639	Temporary Tree and Plant Protection (Add Alternate)	LS	1		
31	044400	Boulder Type A	Each	8		
32	044400	Boulder Type B	Each	10		
33	116800	Horseshoe Pit	Each	7		
34	321313/Special Provisions	Pedestrian Cast-in-Place Concrete Paving	SF	6800		
34A	321313/Special Provisions	Pedestrian Cast-in-Place Concrete Paving (Add Alternate)	SF	5450		
35	321313/Special Provisions	Vehicular Cast-in-place Concrete Paving	SF	1000		
35A	321313/Special Provisions	Vehicular Cast-in-place Concrete Paving (Add Alternate)	SF	360		
36	CDOT M-608-1	Vehicular Ramp	Each	1		
37	CDOT M-608-1	Pedestrian Ramp	Each	1		
38	Special Prov.	Drain Pan	LF	110		
39	Special Prov.	Curb & Gutter	LF	155		
40	Special Prov.	Sidewalk Chase	Each	2		
41	Special Prov.	Park Electrical System	LS	1		
42	265600	Light Type 1	Each	3		

**City of Fruita
Bid Schedule
Reed Park Improvements Project**

<u>No.</u>	<u>Referenced Spec. Section</u>	<u>Item</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Extension</u>
43	323300	Bench Type 1	Each	6		
43A	323301	Bench Type 1 (Add Alternate)		4		
44	323300	Picnic Table Type 1	Each	4		
45	323300	Bike Rack	Each	1		
46	Special Prov.	Trash Bin	Each	1		
47	323119	Decorate Metal Fence	LF	150		
48	321216/Special Provisions	Asphalt Pavement	SY	200		
49	321540	Crushed Stone Surfacing	SF	5000		
50	321363	Painted Pavement Markings	LF	850		
51	321363	Thermoplastic Pavement Markings	Each	4		
52	328433	Irrigation-Design/Build	LS	1		
52A	328433	Irrigation-Design/Build (Add Alternate)	LS	1		
53	334600	4" Perforated HDPE Playground Underdrain pipe	LF	132		
54	334600	6" Perforated PVC Underdrain Pipe	LF	60		
55	334100	6" PVC Storm Sewer Pipe	LF	366		
56	333113	4" SDR-35 PVC Sanitary Sewer Service Pipe	LF	55		
57	333113	4" Sanitary Sewer Cleanouts	Each	2		
58	334100	4" Storm Drain Cleanouts	Each	9		
59	334100	6" Storm Drain Cleanouts	Each	5		
60	334100	Storm Drain Inlets	Each	9		
61	221113	1-1/2" Copper Water Service	LF	145		
62	Construction Plans Sheets C4-00 Through C4-03	Stormwater Pump System	LS	1		
63	S. Shelter Drawings (Blythe Sheets)	Shelter/Restroom (Complete in Place)	LS	1		
64	Special Prov.	Northern Shelter (Install Only)	LS	1		
65	S/W Park Drawings/Specs.	Skate/Wheel Park (Complete in Place)	LS	1		
66	Special Prov.	Contingency/Force Account	LS	1	\$ 200,000.00	\$ 200,000.00
Total Base Bid Amount:						

Company Name: _____

By: _____

Signature: _____

Date: _____